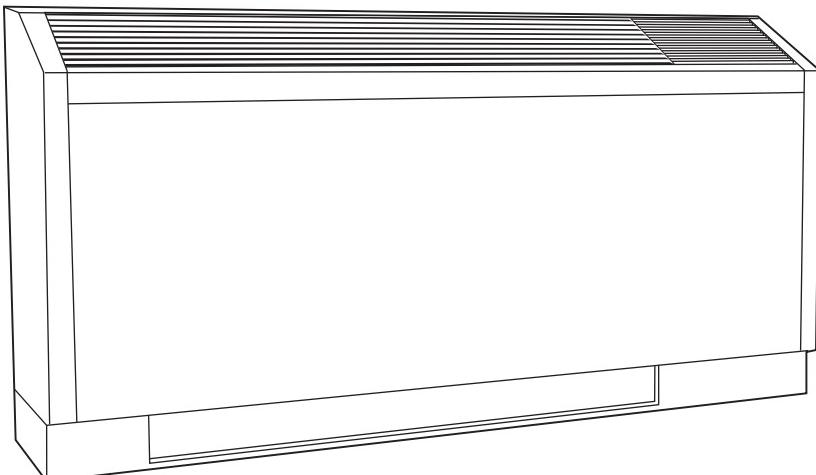




Product Data

**AQUAZONE™
50PEC09-18
Water Source Heat Pumps
Console Unit
with PURON® Refrigerant (R-410A)
50 Hz**

2.1 to 4.5 Nominal kW



Single-package console water source heat pump with self-contained thermostats.

- Non-ozone depleting Puron refrigerant (R-410A)
- Suitable for either geothermal or boiler/tower applications with operating temperature range from -6.7 C to 48.9 C.
- Thermostatic expansion valve (TXV)
- Rubber grommet mounted compressors for quiet operation
- Sloped top cabinet
- Right or left hand piping connection
- Multiple unit-mounted and remote thermostat options
- Adaptable cabinet and subbase configurations
- Factory-mounted flow regulators and control valves for easy installation
- CE Mark approval

Features/Benefits

Carrier's Aquazone console water source heat pumps are a flexible, attractive alternative for all finished interior space, under-window style installations.

Operating efficiency

Aquazone water source heat pump (WSHP) units are designed for quality and performance excellence over their lifetime. Units offer standard cooling COPs (coefficients of performance) up to 4.8 for boiler/tower systems and as high as 6.6 for geothermal applications. Heating COPs are as high as 5.2, among the highest in the industry.



Features/Benefits (cont)



Quiet operation

The Carrier console WSHP provides exceptionally quiet operation for maximum comfort.

Design flexibility

Aquazone™ console WSHP units are offered in 4 capacity sizes to meet individual zone needs efficiently and effectively. Standard and extended operating range units are available to suit a variety of application requirements.

Safe, reliable operation

Standard safety features include: high and low pressure monitoring and field selectable water and air coil freeze protection sensing. All safety controls may be reset at the thermostat. Each unit is tested and run at the factory to ensure proper operation of all components and safety switches.

All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The water-to-refrigerant heat exchanger has copper inner and steel outer tubing which is painted on the outside to provide corrosion resistance protection. Cupronickel heat exchangers are available and should be used on all open loop applications.

Units are rated and certified in accordance with AHRI (Air Conditioning, Heating, and Refrigeration Institute, U.S.A.)/ISO (International Organization for Standardization)/ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) 13256-1 performance standard, and are CSA (Canadian Standards Association)/NRTL (Nationally

Recognized Testing Lab, U.S.A.) listed. Units have CE Mark approval.

Installation ease

The unit is packaged for simple, low cost handling, with minimal time required for installation. The console unit arrives at the jobsite fully assembled to minimize installation time and reduce installation cost. All units are pre-wired and factory charged with Puron® refrigerant (R-410A).

Water connections are available in a variety of configurations direct from the factory. Both FPT and MPT are available as factory-installed options to improve installation efficiency. Additionally, factory-installed motorized water shutoff valves are available for use on energy conserving systems employing a variable pumping technique.

The standard electrical connections are made quickly and directly to a power distribution terminal block. To further improve installation efficiency, a fused or unfused disconnect switch as well as a 20 amp plug and cord are available as factory-installed options.

A vinyl condensate connection is provided for connection to the field-installed condensate line.

For flexibility, the controls can be mounted on the top right or left side. Additionally, the sloped top design discourages the use of the unit as a shelf or coffee holder, preventing air blockage and any spills from damaging the unit.

No-fuss maintenance and serviceability

Regular maintenance or service to the console WSHP units require little time.

Large service access panels enable quick inspection for problem solving and the control box swings down for easy access to the controls.

Fan motor sleeve bearings are permanently lubricated for worry-free performance. If the unit requires service, an easily removable cabinet and slide-out fan section make access simple.

Refrigerant circuit protection is designed to result in fewer service calls. Units are equipped with easily accessible service access ports on both the suction and the discharge refrigerant lines for on-site testing and environmentally correct refrigerant recovery. Filter racks provide easy filter access for cleaning.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board.

Flexible alternatives for many direct digital controls (DDC) applications include the Carrier Comfort Network® (CCN) controls and open protocol systems.

Carrier's Aquazone standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C is one of the most user friendly, low cost, and advanced control boards found in the WSHP industry. Many features are field selectable to provide the ultimate in field installation flexibility. The overall features of this standard control system include:

50-va transformer — Assists in accommodating accessory loads.

Anti-short cycle timer — Provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Ensures a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — Safeguards against unreliable unit operation and prevents refrigerant from leaking.

Table of contents

	Page
Features/Benefits	1-3
Model Number Nomenclature	4
Capacity Ratings	5
Physical Data	5
Options and Accessories	6-8
Dimensions	9-20
Selection Procedure	21
Performance Data	22-28
Application Data	29-32
Electrical Data	33
Typical Control Wiring Schematics	34-39
Typical Piping	40,41
Guide Specifications	42-45

Condensate overflow sensor —

Electronic sensor mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, the unit is automatically deactivated and placed in a lockout condition. The sensor recognizes thirty continuous seconds of overflow as a fault condition.

High and low voltage protection —

Safety protection for excessive or low voltage conditions.

Automatic intelligent reset —

Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — In applications such as variable speed pumping, a

24-v output cycles a motorized water valve or damper actuator with compressor.

Performance monitor (PM) —

Unique feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. A field selectable switch initiates a warning code on the unit display.

Water coil freeze protection

(selectable for water or anti-freeze) — Field selectable switch for

water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check

filter operation) — Field selectable

switch for assessing excessive filter pressure drop initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting — Selectable 24-v or pilot duty dry contact provides remote alarm activation.

Electric heat option — Output provided on the controller for operating two stages of emergency electric heat.

Service Test mode with diagnostic LED (light-emitting diode) — Test mode allows service personnel to

check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays speed up, and the Status LED flashes a code indicating the last fault. This mode provides easy fault diagnosis; based on the fault code the status LED flashes, Carrier provided troubleshooting tables provide easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

Puron® refrigerant (R-410A)

Puron refrigerant (R-410A) is a non-chlorine based refrigerant. Puron refrigerant characteristics, compared to R-22, have:

- Binary and near azeotropic mixture of 50% R-32 and 50% R-125.
- Higher efficiencies (50 to 60% higher operating pressures).

- Non-ozone depleting potential and low global warming potential.
- Virtually no glide. Unlike other alternative refrigerants, the two components in Puron refrigerant have virtually the same leak rates. Therefore, refrigerant can be added if necessary without recovering the charge.

E-coated (electro-coated) air coils

Carrier's 50PEC units are available with an optional e-coated air coil. This electro-coating process will provide years of protection against corrosion from airborne chemicals. Modern building materials, such as countertops, floor coverings, paints and other materials, can "outgas" chemicals into the indoor air. Some of these chemicals are suspected of contributing to corrosion in the air coils found in both traditional and geothermal heating and cooling equipment. Corrosion often results in refrigerant leaks and eventual failure of the air coil costing hundreds of dollars to replace. Studies have also shown that these air coil coatings improve moisture shedding and therefore improve a units moisture removal capability resulting in a more comfortable indoor environment. The 50PEC units assure both maximum air coil life and comfort.

Model number nomenclature



50PEC – Aquazone™ Water Source Heat Pump
Console Unit with Puron®
Refrigerant (R-410A)

Unit Size

09
12
15
18

Water Circuit Options

Connection

Type	Valve Option*
A – Sweat	2-Way Water Control Valve
B – Sweat	Autoflow Regulator, Std Flow
C – Sweat	Autoflow Regulator, High Flow
D – Sweat	2-Way Water Control Valve with Autoflow Regulator, Std Flow
E – Sweat	2-Way Water Control Valve with Autoflow Regulator, High Flow
F – FPT	None
G – FPT	2-Way Water Control Valve
H – FPT	Autoflow Regulator, Std Flow
J – FPT	Autoflow Regulator, High Flow
K – FPT	2-Way Water Control Valve with Autoflow Regulator, Std Flow
L – FPT	2-Way Water Control Valve with Autoflow Regulator, High Flow
M – MPT	None
N – MPT	2-Way Water Control Valve
P – MPT	Autoflow Regulator, Std Flow
Q – MPT	Autoflow Regulator, High Flow
R – MPT	2-Way Water Control Valve with Autoflow Regulator, Std Flow
S – Sweat	None
T – MPT	2-Way Water Control Valve with Autoflow Regulator, High Flow

Water Supply Orientation†

R – Right Hand
L – Left Hand

Control Options

E –	Manual Changeover with Complete C
F –	Auto Changeover with Complete C
G –	Remote Thermostat with Deluxe D
H –	LonWorks†† Interface System with Complete C
J –	Manual Changeover with Deluxe D
K –	Auto Changeover with Deluxe D
Q –	Remote Thermostat with Complete C
V –	LonWorks Interface System with Deluxe D

AUTOFLOW REGULATOR SIZING (L/s)

50PEC UNIT SIZE	Standard (0.5 L/s per kW)	High (0.67 L/s per kW)
09	2.0	2.5
12	2.5	3.0
15	3.0	3.5
18	3.5	4.0



NRTL/C

Cabinet, Subbase and Mute Package Options

O –	Mute Package, Bottom Return, Locking Control Door, and 127 mm Subbase
W –	Mute Package, Bottom Return, and No Subbase
2 –	Mute Package, Bottom Return, Locking Control Door, and No Subbase
3 –	Mute Package, Front Return, and No Subbase
4 –	Mute Package, Front Return, Locking Control Door, and No Subbase
8 –	Mute Package, No Cabinet, and No Subbase
9 –	Mute Package, No Cabinet, and 127 mm Subbase
0 –	Mute Package, Bottom Return, and 127 mm Subbase

Power Termination

A –	Field-Connected, Hard Wired
F –	Disconnect Switch, Non-Fused

Packaging

3 – Export

Revision Code

1 – Current Revision with LG Compressor

Power Supply

7 – 220/240-1-50

Heat Exchanger and Operating Range

A –	Copper Heat Exchanger with Coated Air Coil, Standard Range
C –	Copper Heat Exchanger, Standard Range
E –	Copper Heat Exchanger, Extended Range
F –	Cupronickel Heat Exchanger, Extended Range
J –	Cupronickel Heat Exchanger with Coated Air Coil, Standard Range
M –	Cupronickel Heat Exchanger with Coated Air Coil, Standard Range
N –	Cupronickel Heat Exchanger, Standard Range
V –	Copper Heat Exchanger with Coated Air Coil, Extended Range

LEGEND

DDC — Direct Digital Control

*See table for autoflow regulator sizing.

†Right and left hand orientation is determined by looking at front of unit.

**Sizes 09 and 12 only.

††Registered trademark of Echelon Corporation.

NOTES:

1. Standard 50 Hz unit controls are ETL listed.
2. Complete C controllers take 50-va transformers. Deluxe D controllers take 75-va transformers. All DDC controllers take 75-va transformers.
3. The 50PEC09-15 unit cabinets are 1219 mm with ½-in. water connections. The 50PEC18 unit cabinet is 1372 mm with ¾-in. water connections.

Capacity ratings



50PEC UNIT SIZE	WATER LOOP HEAT PUMP				GROUND WATER HEAT PUMP				GROUND LOOP HEAT PUMP			
	COOLING 30 C		HEATING 20 C		COOLING 15 C		HEATING 10 C		COOLING 25 C		HEATING 0 C	
	CAPACITY WATTS	COP W/W	CAPACITY WATTS	COP	CAPACITY WATTS	COP W/W	CAPACITY WATTS	COP	CAPACITY WATTS	COP W/W	CAPACITY WATTS	COP
09	2100	4.3	2750	5.2	2530	6.4	2290	4.3	2230	4.7	1700	3.2
12	2810	3.9	3490	3.9	3370	6.5	2930	3.3	2990	4.7	2310	2.5
15	3330	3.9	4230	5.0	3840	6.6	3530	4.3	3520	4.7	2720	3.6
18	3660	4.8	4480	4.7	4180	4.1	3810	4.2	3870	4.6	3050	3.5

LEGEND

COP — Coefficient Performance

NOTES:

1. Cooling capacities based upon 27 C db (dry bulb), 19 C wb (wet bulb) entering air temperature.
2. Heating capacities based upon 20 C db, 15 C wb entering air temperature.
3. Ground top heat pump ratings based on 15% methanol antifreeze solution.
4. All ratings based upon operation at lower voltage of dual voltage rated models.



Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

Physical data

BASE UNIT 50PEC	09	12	15	18
COMPRESSOR (Qty)	Rotary (1)			
REFRIG. CHARGE (R-410A)/CKT (kg) No. of Circuits	0.737 1	0.822 1	0.936 1	0.850 1
BLOWER Motor kW Wheel Size D x W (mm) 2 each	0.37 133 x 159	0.62 133 x 159	0.93 133 x 159	0.93 133 x 159
WATER CONNECTION SIZE OD Sweat (in.) Optional FPT Fittings (in.) Optional MPT Fittings (in.)	1/2 1/2 1/2	1/2 1/2 1/2	1/2 1/2 1/2	3/4 3/4 3/4
CONDENSATE CONNECTION SIZE (ID Vinyl) (in.)	5/8	5/8	5/8	5/8
Air Coil Size (h x w) (mm)	203 x 660	254 x 660	254 x 660	254 x 812
FILTER SIZE (h x w x d) (mm) Bottom Return Front Return	254 x 762 x 25 178 x 749 x 3	254 x 762 x 25 178 x 749 x 3	254 x 762 x 25 178 x 749 x 3	254 x 914 x 25 178 x 800 x 3
CABINET SIZE (h x w x d) (mm) Bottom Return With Standard 127 mm Subbase Front Return With No Subbase	1219 x 660 x 305 1219 x 533 x 305	1219 x 660 x 305 1219 x 533 x 305	1219 x 660 x 305 1219 x 533 x 305	1372 x 660 x 305 1372 x 533 x 305
UNIT WEIGHT (kg) Shipping Operating	84 79	86 82	91 86	105 100
Unit Maximum Working Pressure (kPa) Base Unit Internal Secondary Pump Internal Motorized Water Valve Internal Autoflow Valve	3100 999 2067 3100	3100 999 2067 3100	3100 999 2067 3100	3100 999 2067 3100

NOTES:

1. All units have grommet compressor mountings and TXV (thermo-static expansion valve) devices.
2. All pipe sizes are in inches. Equivalent sizes in millimeters follow:

in.	mm
1/2	12.7
5/8	15.9
3/4	19.1

Options and accessories



DESCRIPTION	FACTORY-INSTALLED OPTIONS	FIELD-INSTALLED ACCESSORIES
Cupronickel Heat Exchangers	X	
Thermostat Options	X	
Extended Range	X	
Cabinet Options	X	
Motorized Fresh Air Damper	X	
Piping Connections	X	
Automatic Flow Regulators	X	
Two-Way Motorized Control Valve	X	
Mute Package	X	
Deluxe D Control System	X	
LONWorks® (LONMark® Compliant) Controller	X	
Aquazone™ Thermostats		X
Fire-Rated Hoses		X
Ball Valves		X
Y Strainers		X
Solenoid Valves		X
Hose Kit Assemblies		X
Remote Sensors (CO ₂ , Humidity Sensors)		X

*Registered trademark of Echelon Corporation.

Factory-installed options

Cupronickel heat exchangers are available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Thermostat options include a unit-mounted manual changeover (MCO) or auto changeover (ACO) thermostat. The temperature set point knob and pushbutton switches for fan speed and cool/heat mode (MCO) selection are conveniently located on the top. The thermostat senses the return-air temperature. The thermostat sends the appropriate signal to the controller for cooling or heating mode of operation.

Options R and S allow connection to a remote wall-mounted thermostat. The Complete C controller requires a heat pump thermostat. The Deluxe D controller can be configured for heat pump or heat/cool thermostat.

Extended range is provided to insulate the coaxial coil to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is below the normal operating range (less than 15.6 °C).

Cabinet options include a locking control panel for added security. Bottom or front return with left or right hand configurations are available for ease of installation. Available with 125 mm subbase (bottom return units only), with or without motorized damper.

Motorized fresh air damper with the unit-mounted thermostat. Opens when LOW or HIGH fan speed selections are made from the push button switches. When STOP or FAN ONLY selections are made the spring return on the damper motor closes the damper. With remote thermostat the motorized fresh air damper opens when the fan is running.

Piping connections can be provided on either the right or left hand side of the unit, for easy installation. Orientation is determined by facing the unit from the front side.

Automatic flow regulators include internally mounted 0.5 or 0.67 L/s per kW automatic flow regulating valves for easier installation.

Two-way motorized control valve can be provided with a copper or cupronickel heat exchanger for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit. Standard two-way valve performance includes coefficient of velocity (Cv) of 2.9 and maximum operating pressure differential (MOPD) of 862 kPa.

Mute package includes high density noise suppression material on front, right, and left sides of compressor compartment and 12 mm fiberglass insulation on all insulated surfaces, for extra-quiet operation in the most critical applications.

Deluxe D control system provides the same functions as the Complete C while incorporating additional flexibility and functions to include:

Thermostat input capabilities — Accommodate emergency shutdown mode and night setback with override (NSB) potential. Night setback from low temperature thermostat with 2-hour override is initiated by a momentary signal from the thermostat.

Compressor relay staging — Used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications.

Boilerless electric heat control system — Allows automatic changeover to electric heat at low loop water temperature.

Intelligent reversing valve operation — Minimizes reversing valve operation for extended life and quiet operation.

Thermostat type select (Y, O or Y, W) — Provides ability to work and select heat pump or heat/cool thermostats (Y, W).

Reversing valve signal select (O or B) — Provides selection for heat pump O/B thermostats.

Dehumidistat input — Provides operation of fan control for dehumidification operation.

Multiple units on one thermostat/wall sensor — Provides for communication for up to three heat pumps on one thermostat.

Boilerless changeover temperature — Provides selection of boilerless changeover temperature set point.

Accessory relays — Allow configuration for multiple applications including fan and compressor cycling, digital night setback (NSB), mechanical night setback, water valve operation, and outside air damper operation.

Night low limit — If the unit operation is turned OFF from either the push button switches, remote thermostat or the energy management system, it is possible that the space temperature could drop uncontrollably. The night low limit feature, with Deluxe D controller, helps maintain the space temperature at a level that is the best compromise between energy consumption and a safe space temperature. A thermostat located near the return air filter activates the blower and compressor operation when the space temperature falls below 10.0 °C. When return-air temperature is raised above 12.8 °C the compressor and blower stop.

Override function — An override function is available for units operating in occupied/unoccupied mode under the



control of an external timeclock or an energy management system. A contact closure from the timeclock or energy management system shorts the NSB and C terminal on the Deluxe D controller signaling an unoccupied mode.

For units with the unit-mounted thermostat, pressing override switch (located under control access door) will override the unoccupied mode and allow the occupied mode of operation to continue for a period of two hours.

The units with the remote wall-mounted thermostat require a digital thermostat with the override function. In unoccupied mode, an accessory relay is energized on the Deluxe D controller. The NO/NC contacts of the relay can be used as appropriate input to the digital thermostat to signal occupied/unoccupied mode. The thermostat selects cooling/heating set points based on occupied/unoccupied mode.

LONWorks (LONMark compliant) controller contains the factory-loaded Aquazone™ water source heat pump application for an interoperable control solution.

Field-installed accessories

Carrier's line of Aquazone thermostats (used with remote thermostat units) are both attractive and multi-functional, accommodating stand-alone water source heat pump installations.

Programmable 7-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 7-day programmable with copy command, 4 settings per day, fully electronic, 24 vac, backlit LCD, keypad lockout, no batteries required, 5-minute compressor protection, NEVERLOST™ memory, 3 security levels, temperature display in degrees F or C.

Programmable 7-day light-activated thermostat offers same features as the 7-day programmable thermostat and includes occupied comfort settings with lights on, unoccupied energy savings with lights off.

Programmable 7-day flush-mount thermostat offers the same features as the 7-day programmable thermostat and includes locking coverplate with tamper proof screws, flush to wall mount, holiday/vacation programming, set point limiting, dual point with adjustable deadband, O or B terminal, and optional wall or duct-mounted remote sensor.

Programmable 5-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included,

temperature display in degrees F or C, keypad lockout, backlit display, 5-1-1 programming, O or B terminal, dual set point with adjustable deadband, configurable display, self-prompting program, 4 settings per day.

Non-programmable thermostat offers 2 heat stages, 2 cool stages, auto changeover, 5-minute built in compressor protection, locking cover included, temperature display in degrees F or C, keypad lockout, large display, back-lit display, O or B terminal, dual set point with adjustable deadband, backplate with terminals.

Fire-rated hoses are 0.6 m long and have a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits are provided with both a supply and return hose and can be either stainless steel or galvanized. Five sizes are available.

Ball valves (brass body) used for shutoff and balancing water flow. Available with memory, memory stop, and pressure temperature ports. UL-listed brass body, ball and stem type with Teflon* seats and seals. Five sizes are available.

Y strainers (bronze body) are "Y" type strainers with a brass cap. Maximum operating pressure rating of 3103 kPa. Strainer screen made of stainless steel. Available with blow down valves. Five sizes are available.

Solenoid valves (brass body) offer 3.5 watt coil, 24 volt, 50/60 Hz, 740 amps inrush, 0.312 amps holding. Slow operation for quiet system application. Five sizes are available.

Hose kit assemblies provide all the necessary components to hook up a water-side system. Supply hose includes a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset automatic balancing valve (gpm) with two P/T ports, flexible stainless steel hose with a swivel and nipple, balancing valve, and low-pressure drop water control valve.

Remote sensors are available for Aquazone flush-mount thermostats and for wall (wired and wireless) or duct mounted applications.

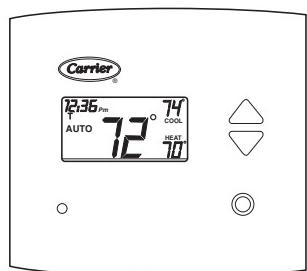
LON (local operating network) wall sensors are available in 3 models: sensor only, sensor with status override indicator, and sensor with set point, status adjustment override, and digital LCD display.

*Teflon is a trademark of E. I. du Pont de Nemours and Company.

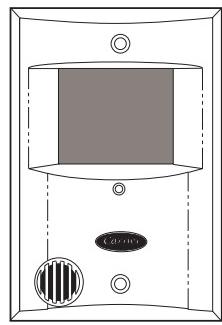
Options and accessories (cont)



AQUAZONE™ THERMOSTATS



7-DAY PROGRAMMABLE/
LIGHT-ACTIVATED PROGRAMMABLE

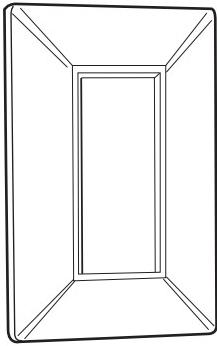


7-DAY PROGRAMMABLE
FLUSH MOUNT

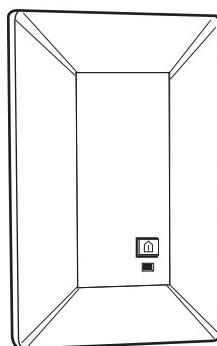


5-DAY PROGRAMMABLE/
NON-PROGRAMMABLE

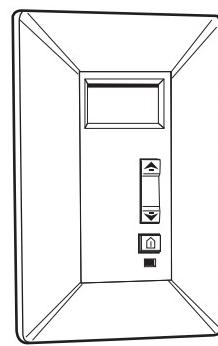
LON WALL SENSORS



SENSOR ONLY



SENSOR WITH OVERRIDE

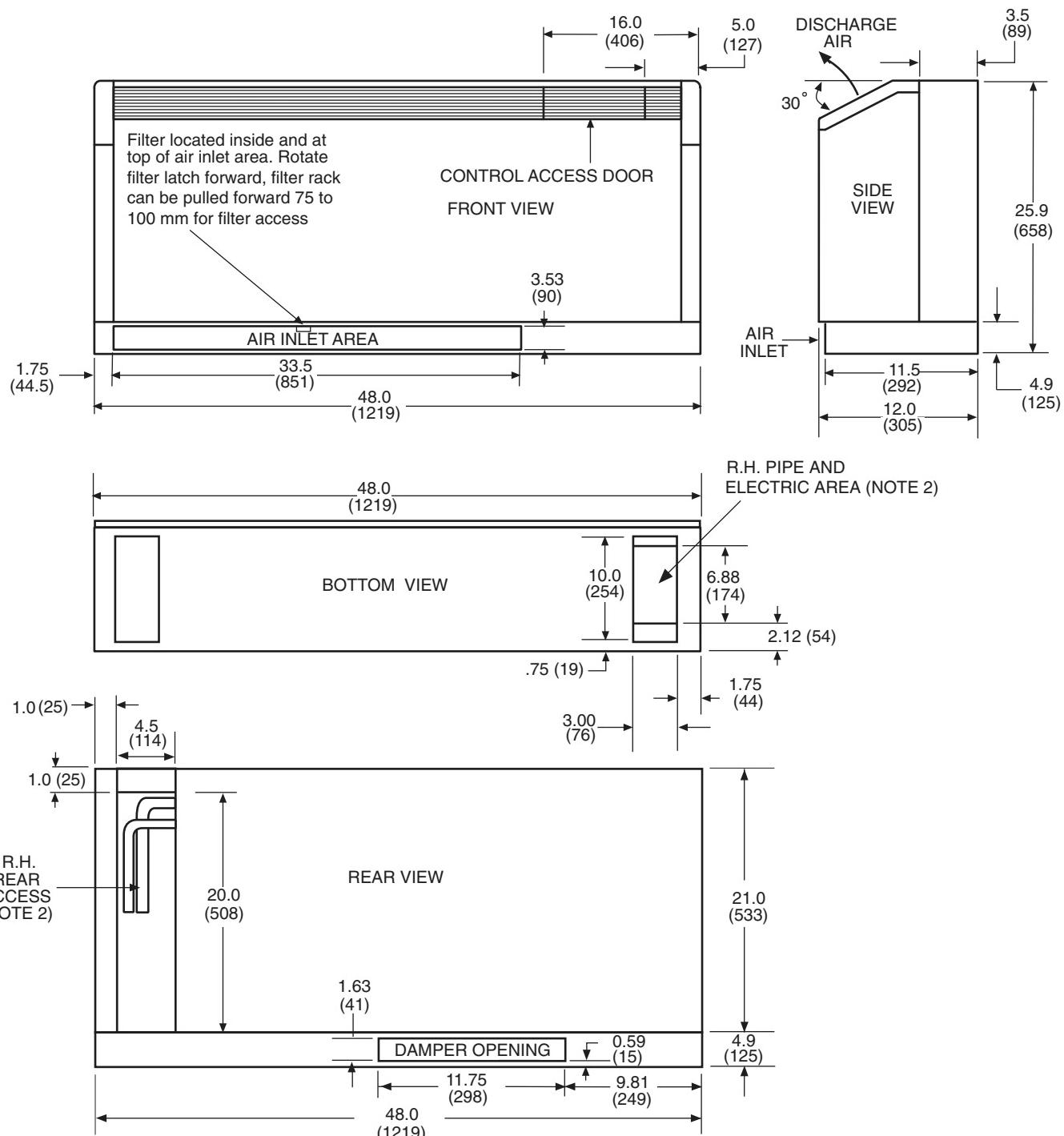


SENSOR WITH SET POINT ADJUSTMENT,
override AND DIGITAL LCD

Dimensions



50PEC09-15 BOTTOM RETURN CABINET DIMENSIONS — RIGHT HAND PIPING



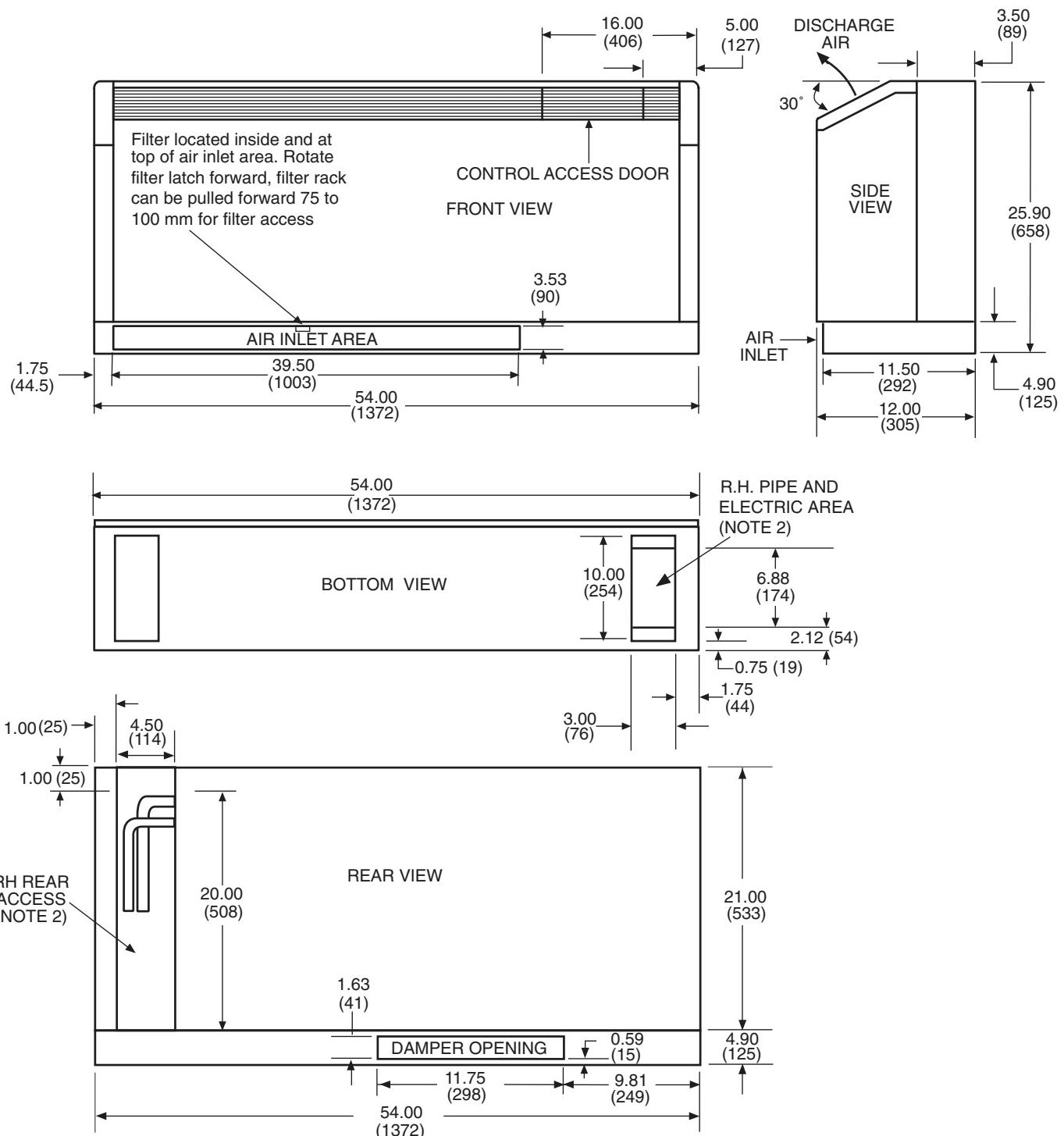
NOTES:

1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Dimensions (cont)

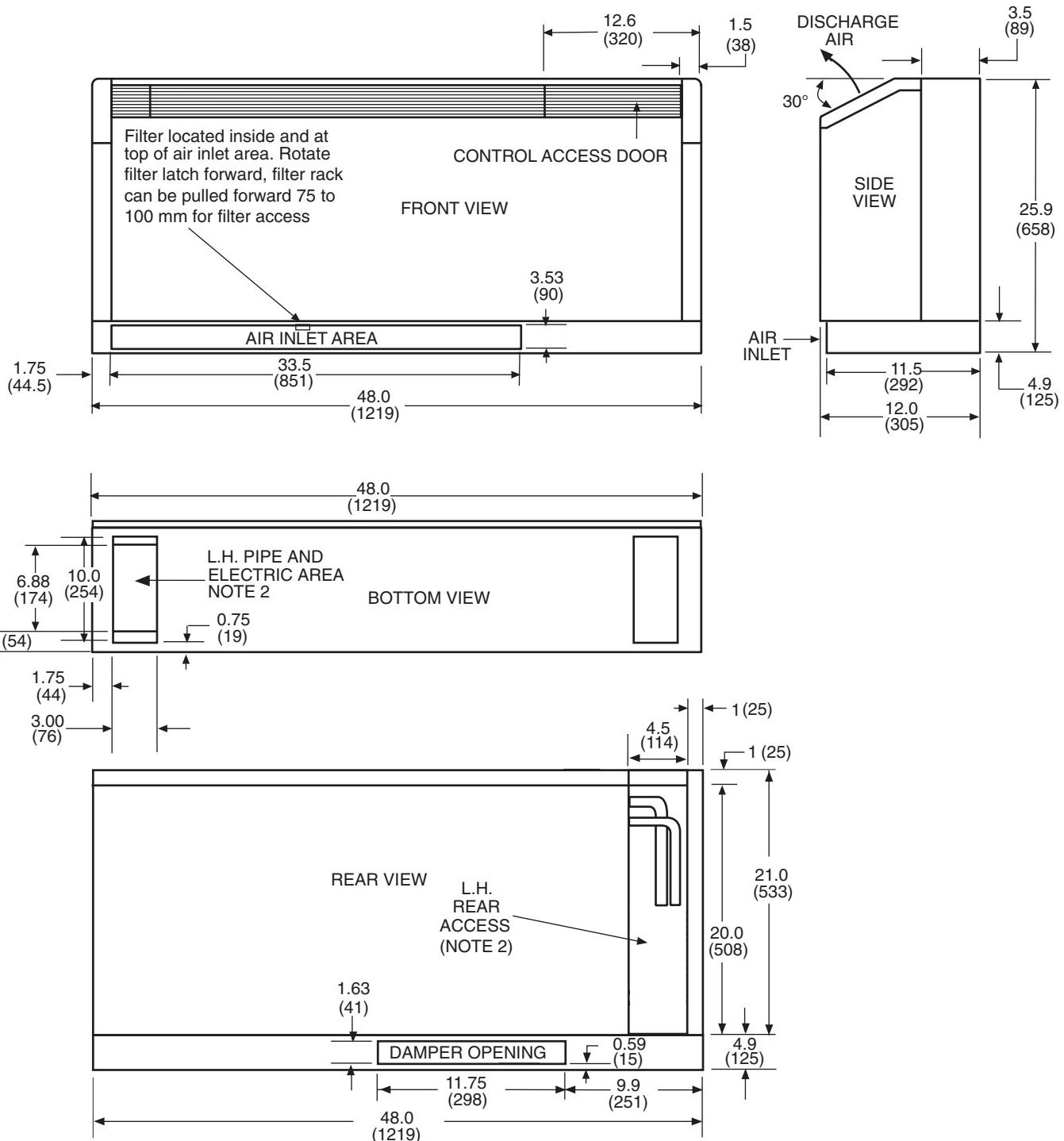


50PEC18 BOTTOM RETURN CABINET DIMENSIONS — RIGHT HAND PIPING



NOTES:

1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

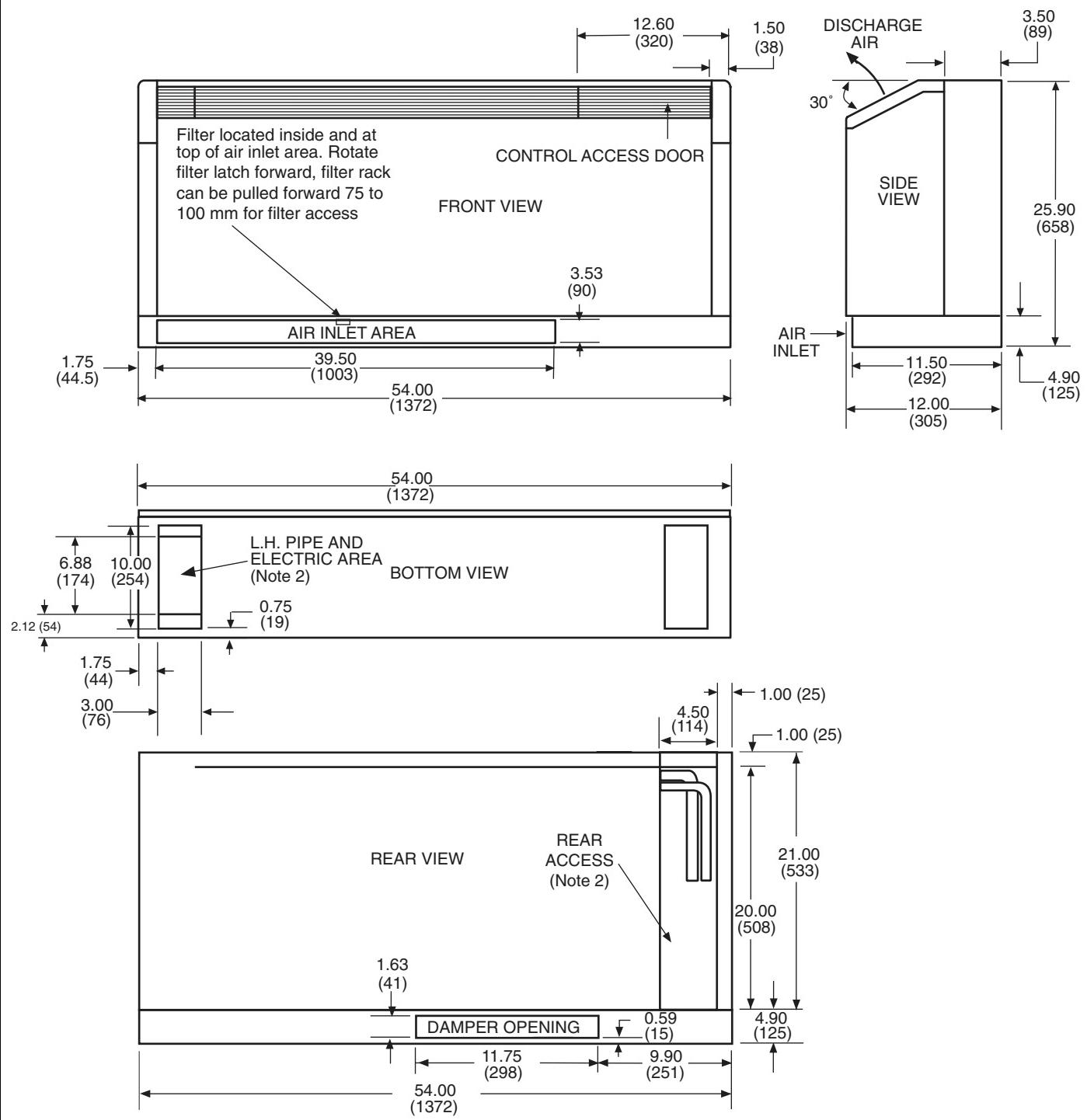
50PEC09-15 BOTTOM RETURN CABINET DIMENSIONS — LEFT HAND PIPING

NOTES:

1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Dimensions (cont)

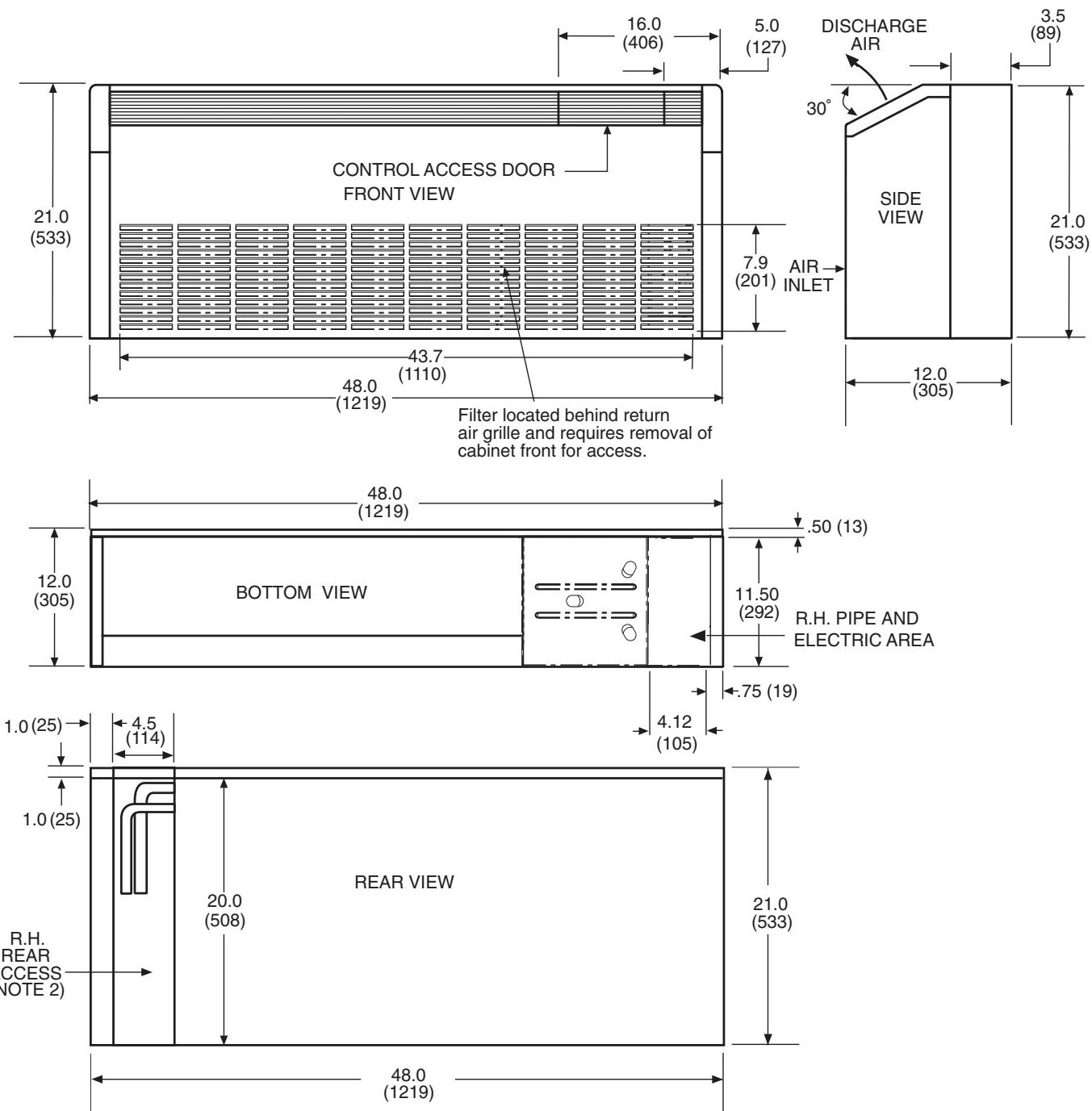


50PEC18 BOTTOM RETURN CABINET DIMENSIONS — LEFT HAND PIPING



NOTES:

1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autowflow valve, motorized water valve and disconnect box are shown.

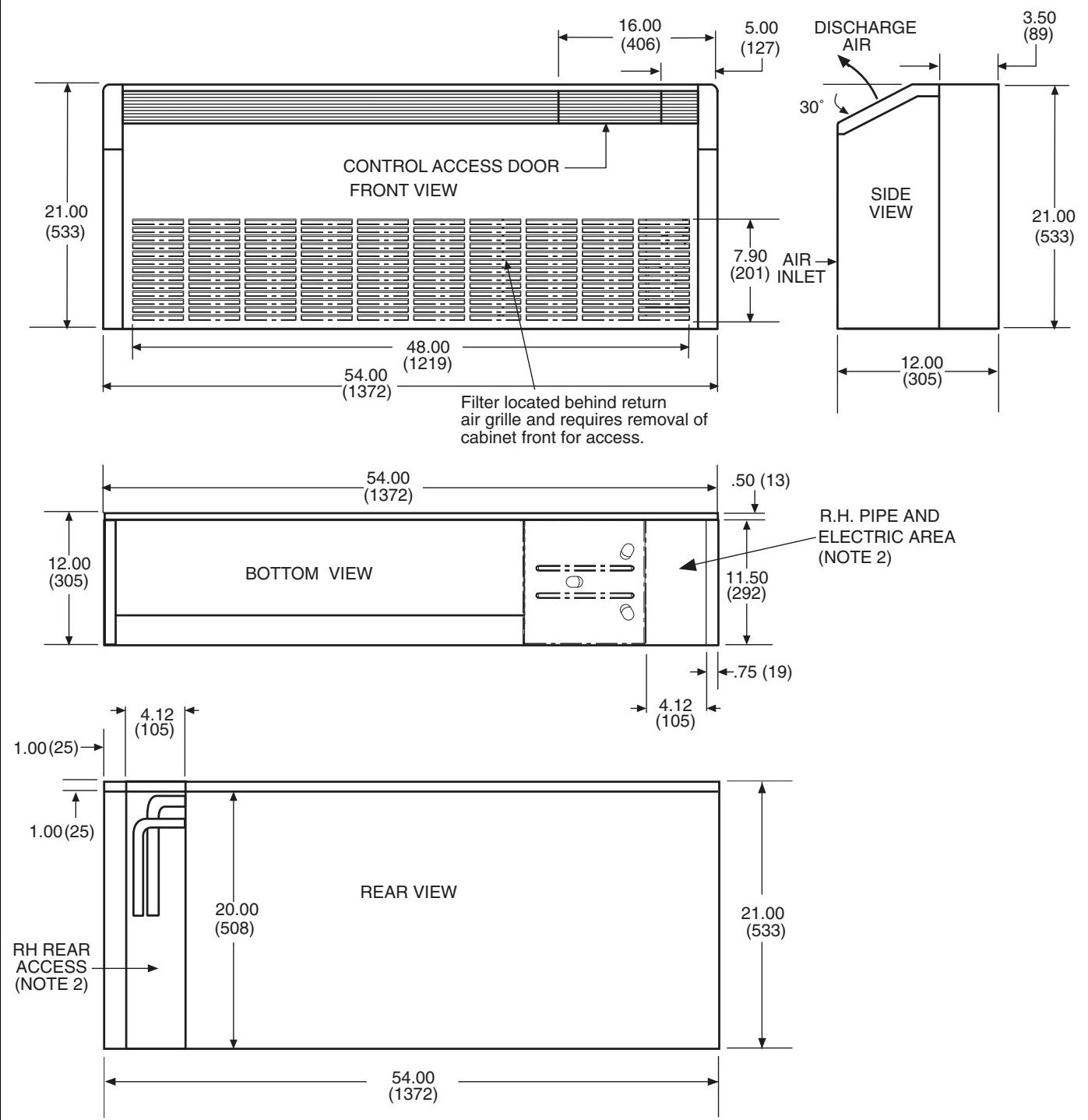
50PEC09-15 FRONT RETURN CABINET DIMENSIONS — RIGHT HAND PIPING

NOTES:

- Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
- Access is reduced if optional disconnect box is selected.
- Optional autoflow valve, motorized water valve and disconnect box are shown.

Dimensions (cont)

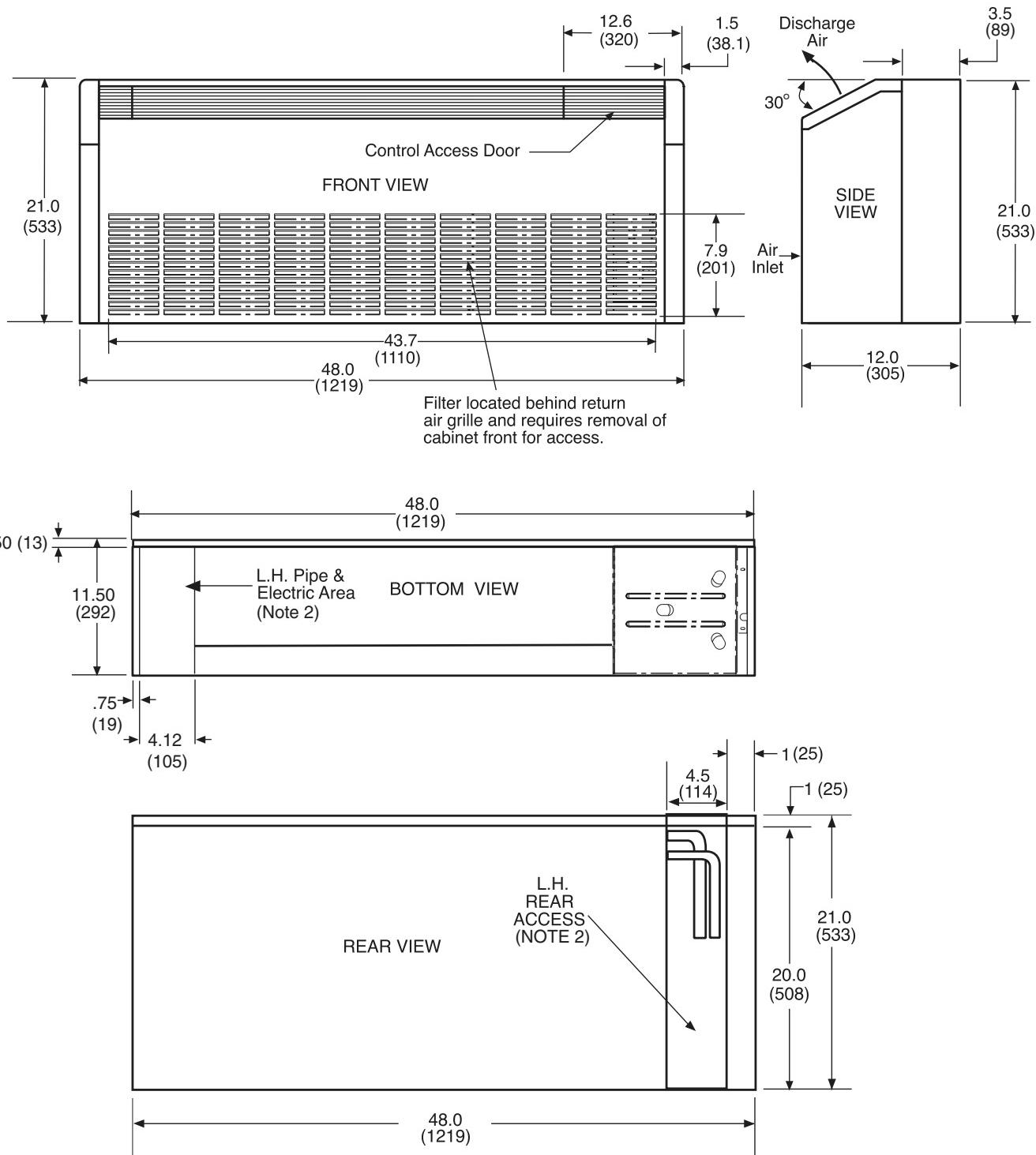


50PEC18 FRONT RETURN CABINET DIMENSIONS — RIGHT HAND PIPING



NOTES:

1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

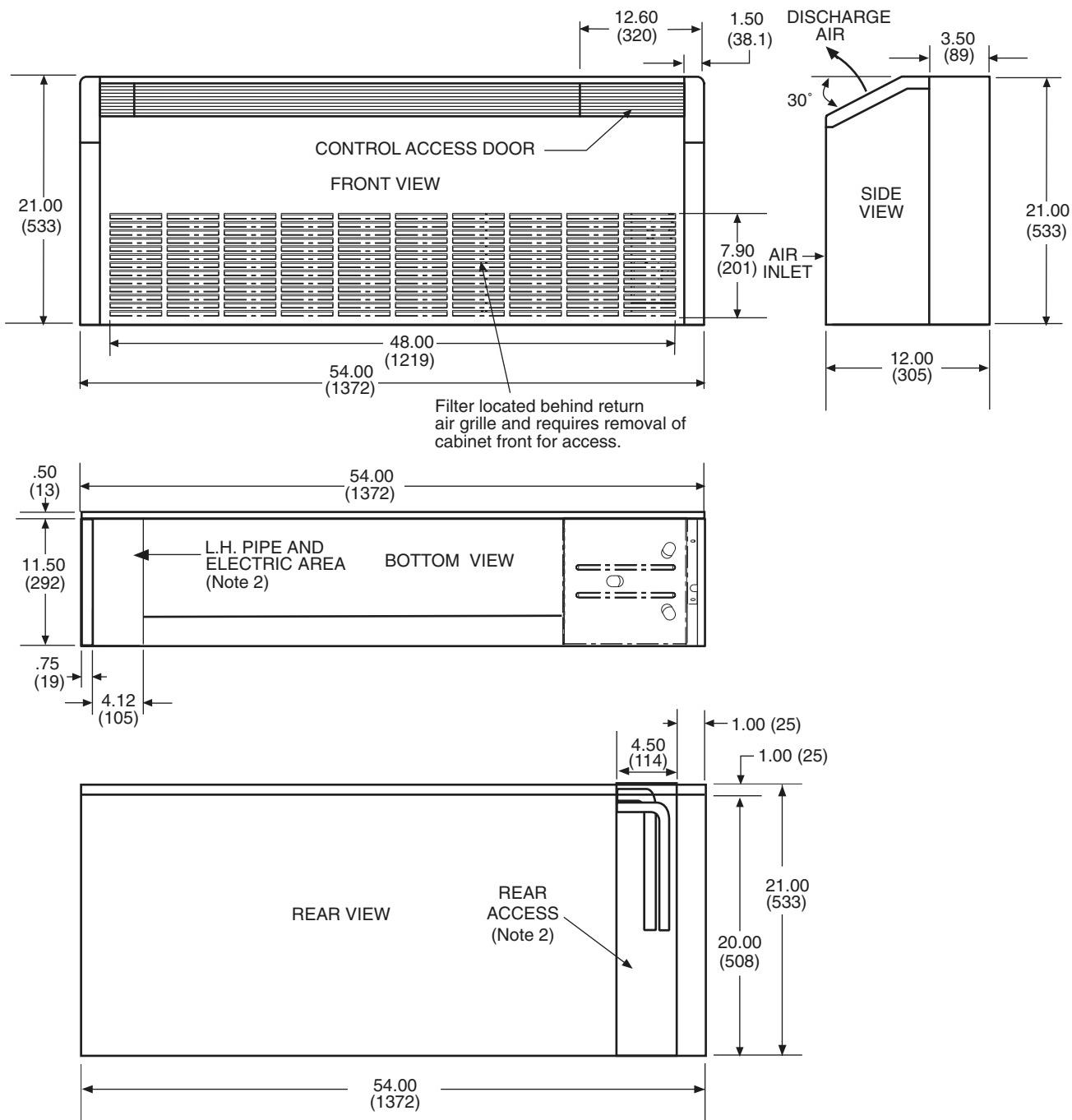
50PEC09-15 FRONT RETURN CABINET DIMENSIONS — LEFT HAND PIPING

NOTES:

1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Dimensions (cont)



50PEC18 FRONT RETURN CABINET DIMENSIONS — LEFT HAND PIPING

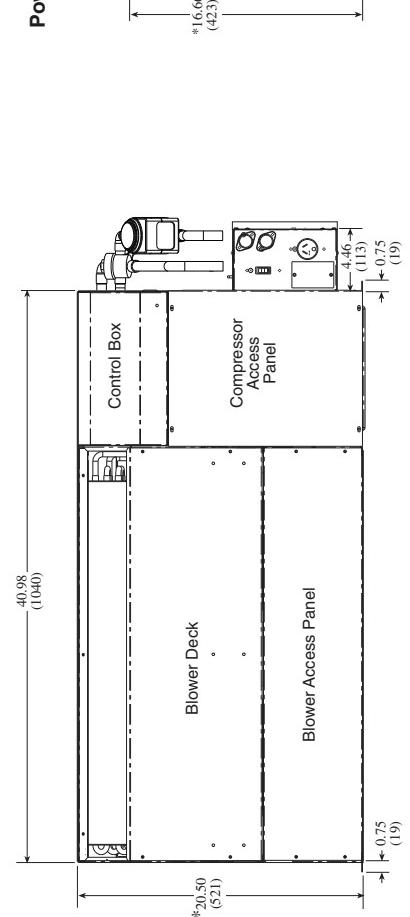


NOTES:

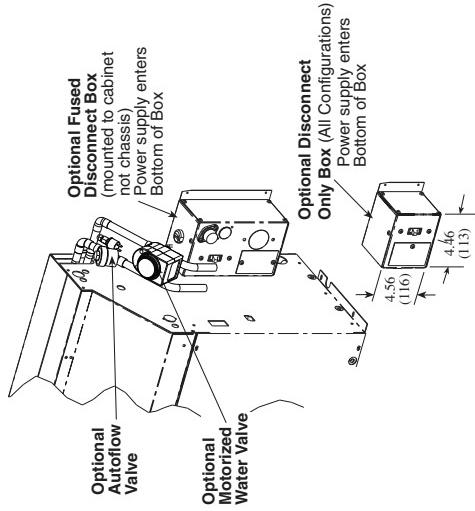
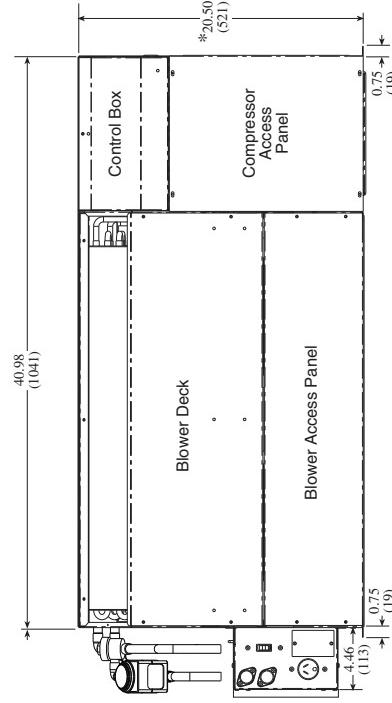
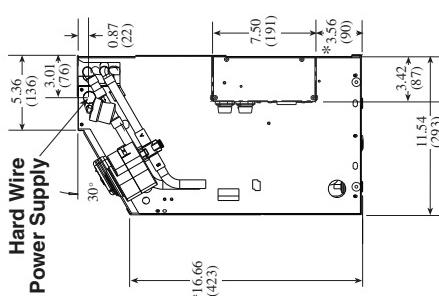
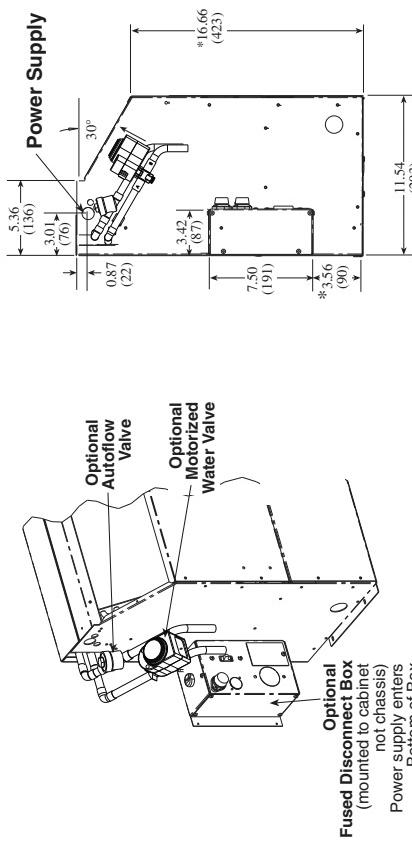
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

50PEC09-15 CHASSIS DIMENSIONS — BOTTOM RETURN

RIGHT HAND CONFIGURATION



LEFT HAND CONFIGURATION



*If optional subbase is selected or if unit is installed raised above the floor, add 125 mm to dimension.

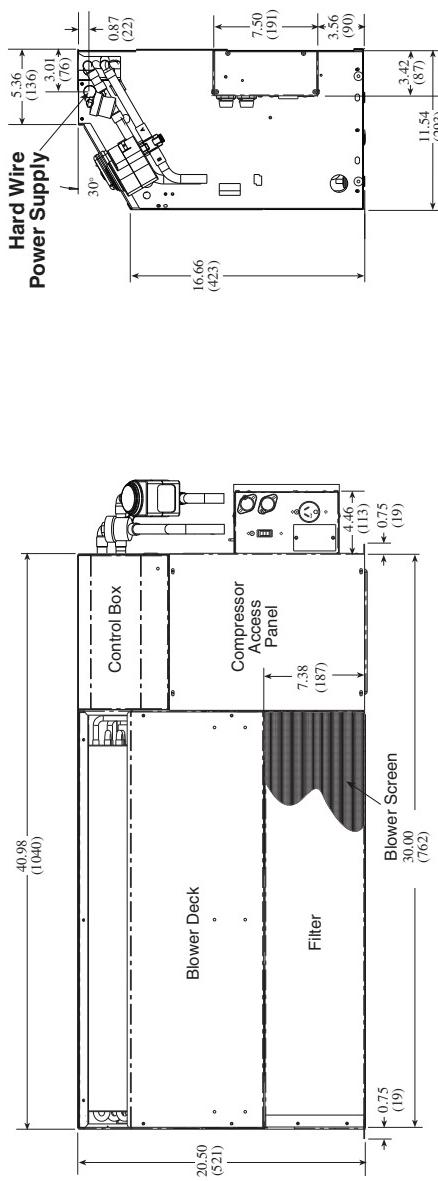
- NOTES:**
1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
 2. Optional autoflow valve, motorized water valve and disconnect box are shown.

Dimensions (cont)

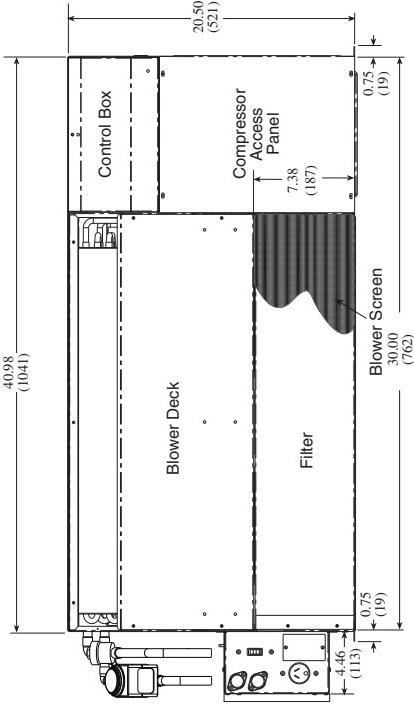
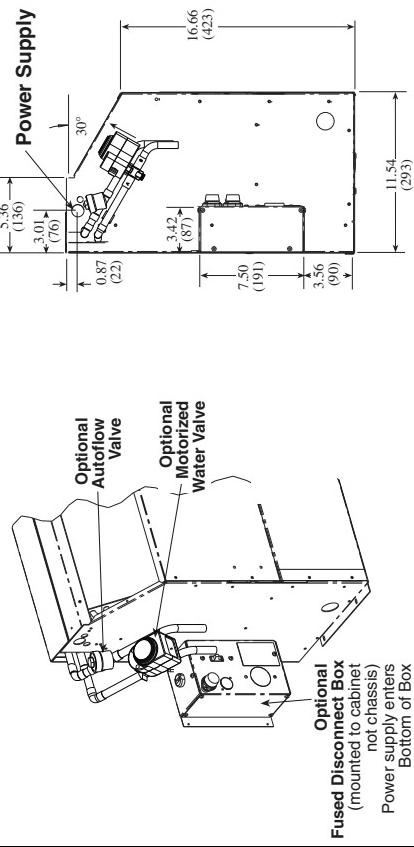


50PEC09-1.5 CHASSIS DIMENSIONS — FRONT RETURN

RIGHT HAND CONFIGURATION



LEFT HAND CONFIGURATION

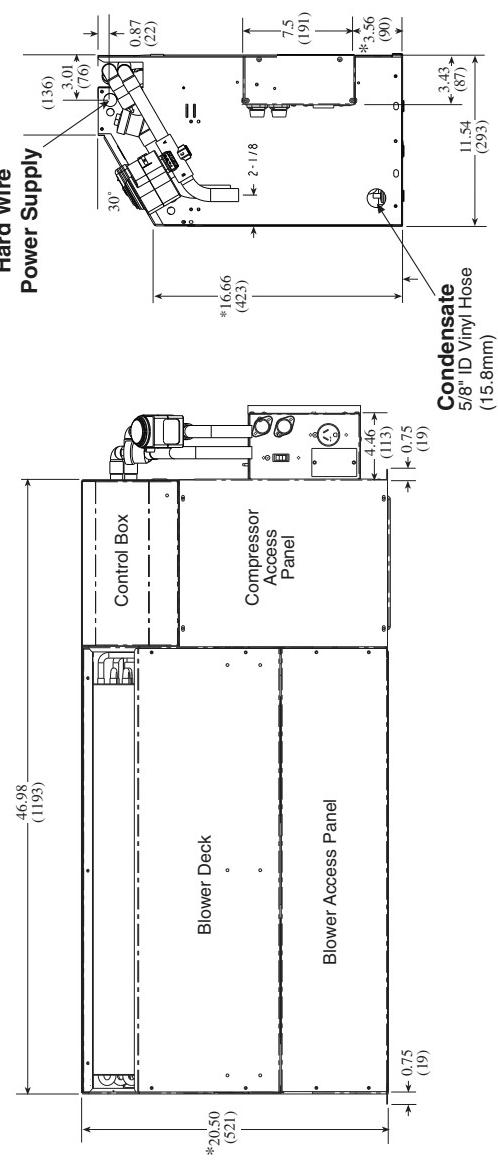


NOTES:

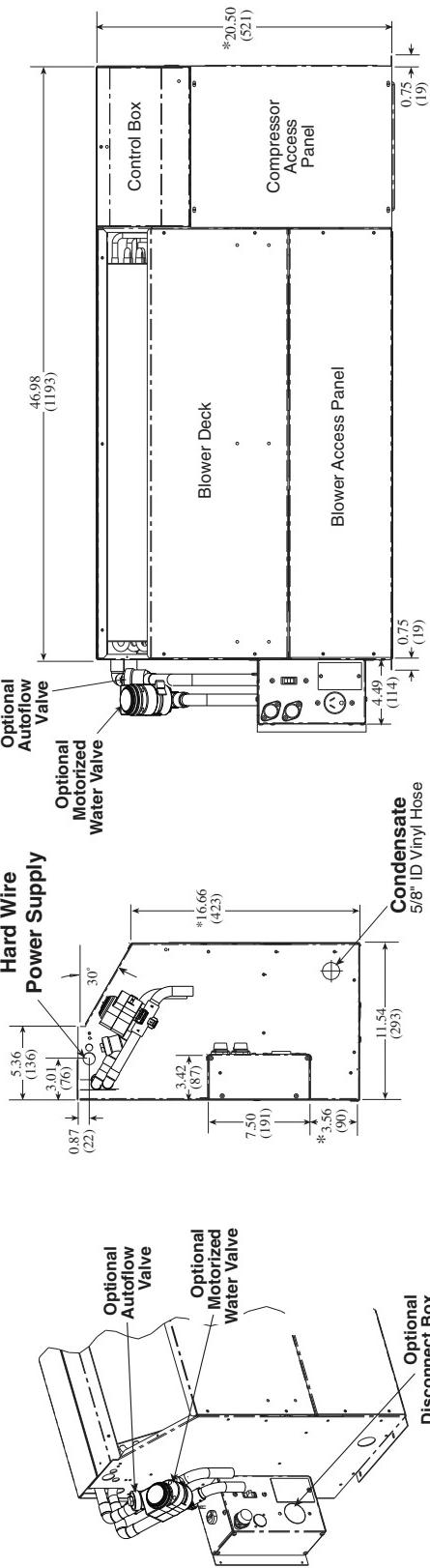
1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
2. Optional autoflow valve, motorized water valve and disconnect box are shown.
3. Chassis can mount directly on floor.

50PEC18 CHASSIS DIMENSIONS — BOTTOM RETURN

RIGHT HAND CONFIGURATION



LEFT HAND CONFIGURATION



*If optional subbase is selected, add 125 mm to dimension.

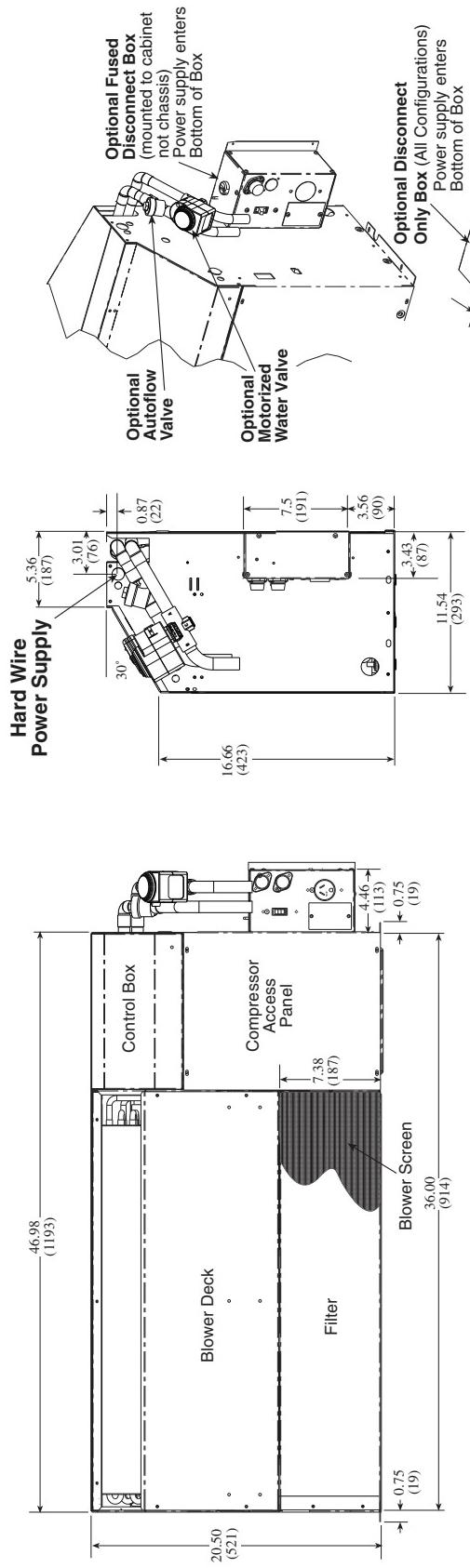
- NOTES:**
1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
 2. Optional autoflow valve, motorized water valve and disconnect box are shown.

Dimensions (cont)

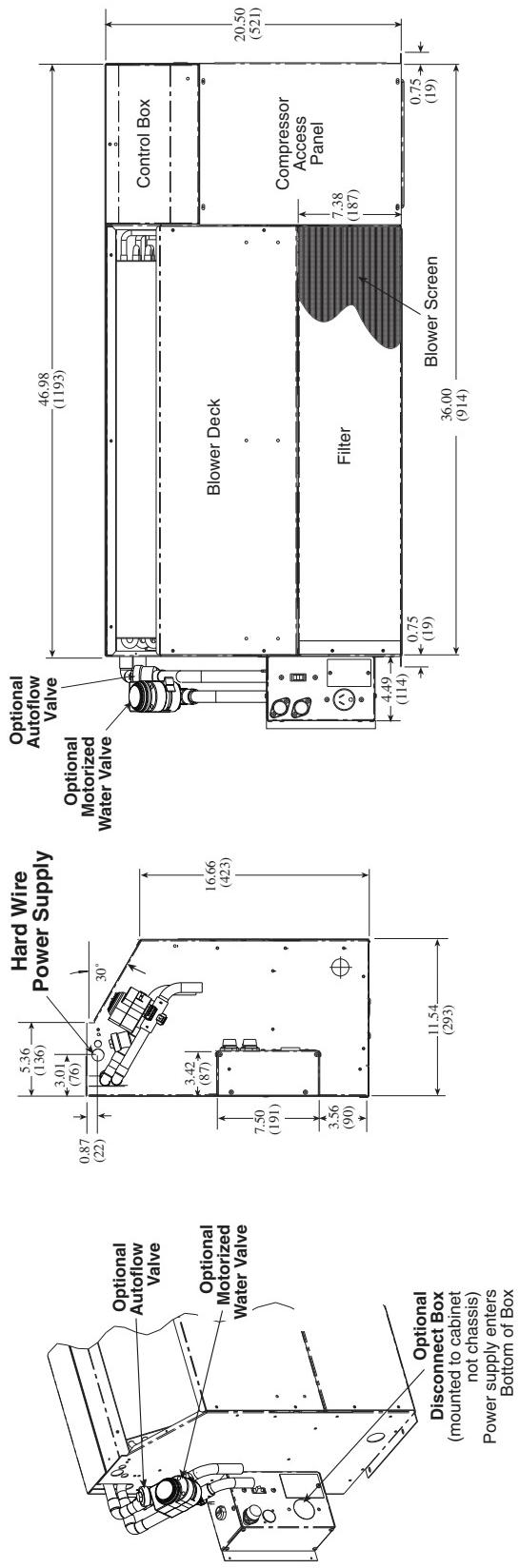


50PEC18 CHASSIS DIMENSIONS – FRONT RETURN

RIGHT HAND CONFIGURATION



LEFT HAND CONFIGURATION



NOTES:

1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
2. Optional autoflow valve, motorized water valve and disconnect box are shown.
3. Chassis can mount directly on floor.

Selection procedure (with 50PEC12 example)



I Determine the actual cooling and heating loads at the desired dry bulb and wet bulb conditions.

Given:

Total Cooling (TC) 2.7 kW
Sensible Cooling (SC) 2.3 kW
Entering-Air Temperature db 27 C
Entering-Air Temperature wb 19 C

II Determine the following design parameters.

Determine entering water temperature, water flow rate (L/s), airflow (L/s), water flow pressure drop and design wet and dry bulb temperatures. Airflow should be between 40 and 60 L/s per kW. For applications using multiple units, the water pressure drop should be kept as close as possible across units to make water balancing easier. Enter the 50PEC12 Performance Data tables and find the proper indicated water flow and water temperature.

For example:

Entering Water Temp 30 C
Water Flow (Based upon
6.7 C rise in temp) 0.126 L/s
Airflow. 154 L/s

III Select a unit based on total cooling and total sensible cooling conditions.

Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities.

NOTE: Interpolation is permissible, extrapolation is not.

For example:

Enter the 50PEC12 Performance Table at design water flow and water temperature. Read Total Cooling, Sensible Cooling and Heat of Extraction capacities:

Total Cooling 2.76 kW
Sensible Cooling 2.30 kW
Heat of Rejection 3.50 kW

NOTE: It is quite normal for water source heat pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity. Heating capacity is selected based on different entering water conditions than cooling capacity.

IV Determine the correction factors associated with the variable factors of dry bulb and wet bulb using the Corrections Factor tables found in this book.

Using the following formulas to determine the correction factors of dry bulb and wet bulb:

- Corrected Total Cooling = tabulated total cooling x wet bulb correction x airflow correction.
- Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction x airflow correction

V Determine entering air and airflow correction using the Corrections Factor tables found in this book.

The nominal airflow for 50PEC12 is 175 L/s. The design parameter is 154 L/s.

$$154/175 = 88\% \text{ of nominal airflow}$$

Use the 89% row in the Correction Factors — Airflow table.

The Entering Air Temperature wb is 19 C. Use the 19 C row in the Entering Air Correction table.

Using the following formulas to determine the correction factors of entering air and airflow correction:

Table	Ent Air	Airflow	Corrected
Corrected Total Cooling	= 2.76	x 1.000	x 0.974 = 2.69
Corrected Sensible Cooling	= 2.30	x 1.000	x 0.974 = 2.24
Corrected Heat of Rejection	= 3.50	x 1.000	x 0.974 = 3.41

Compare the corrected capacities to the load requirements established in Step I. If the capacities are within 10% of the load requirements, the equipment is acceptable. It is better to undersize than oversize as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

VI Water temperature rise calculation and assessment.

Calculate the water temperature rise and assess the selection using the following calculation:

$$\text{Actual Temperature Rise} = \frac{\text{Correction of Heat Rejection}}{\text{L/s} \times 4.16}$$

For example, using the Corrected Heat of Extraction from the last step:

$$\text{Actual Temperature Rise} = \frac{3.41}{0.126 \times 4.16} = 6.5 \text{ C}$$

If the units selected are not within 10% of the load calculations, review what effect changing the water flow, water temperature and/or airflow will have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat Steps I through VI.

Performance data



50PEC AIRFLOW CORRECTION TABLE

AIRFLOW % of Rated	COOLING				HEATING		
	Total Capacity	Sensible Capacity	Power (kW)	Heat of Rejection	Heating Capacity	Power (kW)	Heat of Extraction
75	0.950	0.910	0.970	0.910	0.970	1.070	0.950
83	0.964	0.953	0.981	0.953	0.983	1.042	0.968
89	0.974	0.974	0.987	0.974	0.990	1.026	0.981
94	0.987	0.990	0.993	0.990	0.995	1.012	0.991
100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
106	1.015	1.002	1.008	1.002	1.004	0.991	1.007
111	1.031	0.996	1.016	0.996	1.006	0.985	1.011

50PEC ENTERING AIR CORRECTION TABLE — HEATING

HEATING CORRECTIONS			
Ent Air DB C	Heating Capacity	kW	Heat of Extraction
15	1.030	0.910	1.060
17	1.019	0.949	1.037
20	1.000	1.000	1.000
22	0.987	1.032	0.975
24	0.973	1.065	0.950
26	0.960	1.109	0.931

LEGEND

DB — Dry Bulb

50PEC ENTERING AIR CORRECTION TABLE — COOLING

Ent Air WB (C)	Total Cooling Capacity (kW)	Sensible Cooling Capacity Multiplier - Entering DB (C)							kW	Heat of Rejection
		21	23	25	27	29	32	35		
15	0.900	0.7000	0.9000	1.0000	*	*	*	*	1.0000	0.9000
17	0.961	0.6801	0.8495	0.9996	*	*	*	*	1.0014	0.9631
19	1.000	0.5261	0.7376	0.9140	1.0000	1.1602	*	*	1.0000	1.0000
21	1.050	—	0.5663	0.7679	0.8461	1.0202	1.1870	*	0.9999	1.0408
23	1.100	—	—	0.5000	0.5000	0.7000	0.9000	1.1000	1.0000	1.1000
25	1.176	—	—	0.5250	0.5910	0.7980	1.0040	1.1780	1.0470	1.1490

LEGEND

DB — Dry Bulb

WB — Wet Bulb

*Sensible capacity equals total capacity.

NOTE: AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling — 27.0 C db/19.0 C wb and Heating — 20.0 C db/15.0 C wb entering air temperature.



50PEC ANTIFREEZE CORRECTION TABLE

ANTIFREEZE TYPE	ANTIFREEZE %	COOLING			HEATING		WPD CORRECTION FACTOR	
		EWT 32 C			EWT -1 C			
		Total Capacity	Sensible Capacity	kW	Heating Capacity	kW		
Water	0	1.000	1.000	1.000	1.000	1.000	1.000	
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070	
	15	0.986	0.986	1.009	0.968	0.990	1.210	
	25	0.978	0.978	1.014	0.947	0.983	1.360	
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070	
	15	0.990	0.990	1.007	0.968	0.990	1.160	
	25	0.982	0.982	1.012	0.949	0.984	1.220	
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140	
	15	0.994	0.994	1.005	0.944	0.983	1.300	
	25	0.986	0.986	1.009	0.917	0.974	1.360	
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040	
	15	0.994	0.994	1.004	0.980	0.994	1.120	
	25	0.988	0.988	1.008	0.966	0.990	1.200	

LEGEND

EWT — Entering Wet Bulb

WPD — Water Pressure Differential

Performance data (cont)



50PEC09 — NOMINAL AIRFLOW 151 L/s HEATING AND 142 L/s COOLING

EWT (C)	FLOW		WPD (kPa)	COOLING - EAT 27/19 C						HEATING - EAT 20 C				
	L/s	L/m		TC (kW)	SC (kW)	S/T Ratio	Power (kW)	HR (kW)	EER	HC (kW)	Power (kW)	HE (kW)	LAT (C)	COP
-5.0	0.139	8.33	34.52	Operation Not Recommended						1.33	0.53	0.8	29.2	2.52
0.0	0.069	4.16	11.05	2.85	2.05	0.72	0.33	3.2	8.7	1.61	0.54	1.1	29.4	2.98
	0.101	6.06	17.95	2.90	2.04	0.70	0.30	3.2	9.6	1.69	0.54	1.1	30.0	3.11
	0.139	8.33	31.07	2.93	2.04	0.70	0.29	3.2	10.2	1.75	0.55	1.2	30.3	3.19
5.0	0.069	4.16	9.67	2.75	2.07	0.75	0.37	3.1	7.5	1.96	0.56	1.4	31.4	3.52
	0.101	6.06	15.88	2.81	2.06	0.73	0.34	3.2	8.2	2.06	0.56	1.5	32.0	3.68
	0.139	8.33	29.00	2.85	2.05	0.72	0.33	3.2	8.7	2.12	0.56	1.6	32.5	3.77
10.0	0.069	4.16	8.29	2.65	2.08	0.79	0.41	3.1	6.5	2.27	0.57	1.7	33.3	4.02
	0.101	6.06	15.19	2.71	2.07	0.76	0.38	3.1	7.1	2.38	0.57	1.8	33.9	4.18
	0.139	8.33	26.24	2.75	2.07	0.75	0.37	3.1	7.5	2.45	0.57	1.9	34.1	4.28
15.0	0.069	4.16	7.60	2.52	2.07	0.82	0.45	3.0	5.6	2.56	0.57	2.0	35.0	4.46
	0.101	6.06	14.50	2.60	2.08	0.80	0.43	3.0	6.1	2.67	0.58	2.1	35.6	4.63
	0.139	8.33	25.55	2.64	2.08	0.79	0.41	3.1	6.4	2.74	0.58	2.2	36.0	4.74
20.0	0.069	4.16	6.90	2.38	2.04	0.86	0.50	2.9	4.8	2.82	0.58	2.2	36.4	4.86
	0.101	6.06	13.81	2.46	2.06	0.84	0.47	2.9	5.2	2.93	0.58	2.3	37.1	5.04
	0.139	8.33	24.17	2.51	2.07	0.82	0.45	3.0	5.5	3.00	0.58	2.4	37.5	5.15
25.0	0.069	4.16	6.90	2.22	1.97	0.89	0.55	2.8	4.1	3.05	0.58	2.5	37.8	5.23
	0.101	6.06	13.12	2.31	2.01	0.87	0.52	2.8	4.4	3.16	0.58	2.6	38.4	5.40
	0.139	8.33	22.10	2.36	2.03	0.86	0.50	2.9	4.7	3.23	0.59	2.6	38.8	5.51
30.0	0.069	4.16	6.90	2.12	1.91	0.90	0.57	2.7	3.7	3.15	0.59	2.6	38.4	5.40
	0.101	6.06	13.12	2.22	1.97	0.89	0.55	2.8	4.1	3.26	0.59	2.7	39.0	5.56
	0.139	8.33	21.40	2.28	1.99	0.88	0.51	2.8	4.3	3.33	0.59	2.7	39.4	5.67
35.0	0.069	4.16	6.21	2.03	1.86	0.91	0.60	2.6	3.4	Operation Not Recommended				
	0.101	6.06	13.12	2.13	1.92	0.90	0.57	2.7	3.7					
	0.139	8.33	20.71	2.19	1.95	0.89	0.55	2.7	4.0					
40.0	0.069	4.16	6.21	1.82	1.70	0.93	0.66	2.5	2.8					
	0.101	6.06	12.43	1.93	1.78	0.92	0.63	2.6	3.1					
	0.139	8.33	20.02	1.99	1.83	0.92	0.61	2.6	3.3					
45.0	0.069	4.16	6.21	1.59	1.50	0.94	0.72	2.3	2.2					
	0.101	6.06	12.43	1.70	1.60	0.94	0.69	2.4	2.5					
	0.139	8.33	20.02	1.77	1.66	0.94	0.67	2.4	2.6					

LEGEND

ARHI	— Air Conditioning Heating, and Refrigeration Institute
db	— Dry Bulb
COP	— Coefficient of Performance
Cv	— Coefficient of Velocity
EAT	— Entering Air Temperature (C)
EER	— Energy Efficiency Ratio
EWT	— Entering Water Temperature (C)
HC	— Heating Capacity (kW)
HE	— Heat of Extraction (kW)
HR	— Heat of Rejection (kW)
ISO	— International Organization for Standardization
LAT	— Latent Heat (kW)
MOPD	— Maximum Opening Pressure Difference
SC	— Sensible Capacity (kW)
S/T	— Sensible/Total
TC	— Total Capacity (kW)
wb	— Wet Bulb
WPD	— Water Pressure Differential

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 27 C db and 19 C wb in cooling and 20 C db in heating.
3. AHRI/ISO certified conditions are 27 C db 19 C wb in cooling and 20 C db in heating.
4. Table does not reflect fan or pump power connections for AHRI/ISO conditions.
5. All performance data is based upon the lower voltage of dual voltage rated units.
6. Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
7. Operation below 4 C EWT is based on 15% methanol antifreeze solution.
8. Operation below 16 C EWT requires optional insulated water/refrigerant circuit.
9. See performance correction tables for operating conditions other than those listed above.
10. Shaded area refers to calculations required to determine if heating water flow is sufficient for the non-antifreeze systems.

WPD ADDER FOR MOTORIZED VALVE,

50PEC09 UNIT

(Cv = 4.9, MOPD = 862 kPa)

L/s	WPD Adder (kPa)
0.07	2.1
0.10	4.1
0.14	8.3



50PEC12 — NOMINAL AIRFLOW 184 L/s HEATING AND 175 L/s COOLING

EWT (C)	FLOW		WPD (kPa)	COOLING - EAT 27/19 C						HEATING - EAT 20 C				
	L/s	L/m		TC (kW)	SC (kW)	S/T Ratio	Power (kW)	HR (kW)	EER	HC (kW)	Power (kW)	HE (kW)	LAT (C)	COP
-5.0	0.164	9.84	43.4	Operation Not Recommended						1.90	0.65	1.3	28.3	1.94
0.0	0.082	4.92	9.7	3.32	2.44	0.73	0.45	3.8	7.30	2.14	0.66	1.5	29.4	2.24
	0.126	7.57	27.6	3.19	2.33	0.73	0.46	3.6	6.96	2.24	0.67	1.6	29.8	2.37
	0.164	9.84	39.3	3.11	2.27	0.73	0.47	3.6	6.69	2.29	0.67	1.6	30.0	2.43
5.0	0.082	4.92	9.0	3.38	2.51	0.74	0.48	3.9	7.10	2.48	0.68	1.8	30.9	2.66
	0.126	7.57	24.1	3.35	2.47	0.74	0.46	3.8	7.32	2.60	0.68	1.9	31.4	2.80
	0.164	9.84	36.5	3.32	2.43	0.73	0.45	3.8	7.30	2.65	0.69	2.0	31.6	2.86
10.0	0.082	4.92	9.0	3.34	2.52	0.76	0.52	3.9	6.40	2.81	0.70	2.1	32.3	3.04
	0.126	7.57	20.7	3.38	2.52	0.75	0.49	3.9	6.94	2.94	0.70	2.2	32.9	3.18
	0.164	9.84	33.1	3.38	2.51	0.74	0.48	3.9	7.12	3.00	0.71	2.3	33.1	3.25
15.0	0.082	4.92	7.6	3.21	2.48	0.77	0.58	3.8	5.53	3.12	0.71	2.4	33.6	3.38
	0.126	7.57	18.6	3.31	2.51	0.76	0.54	3.8	6.17	3.25	0.72	2.5	34.3	3.53
	0.164	9.84	30.3	3.34	2.52	0.75	0.52	3.9	6.43	3.32	0.72	2.6	34.5	3.59
20.0	0.082	4.92	6.9	3.04	2.42	0.79	0.65	3.7	4.67	3.40	0.73	2.7	34.9	3.69
	0.126	7.57	17.2	3.17	2.47	0.78	0.60	3.8	5.27	3.54	0.73	2.8	35.5	3.84
	0.164	9.84	29.0	3.22	2.48	0.77	0.58	3.8	5.55	3.61	0.74	2.9	35.8	3.90
25.0	0.082	4.92	6.2	2.84	2.33	0.82	0.73	3.6	3.90	3.67	0.74	2.9	36.1	3.96
	0.126	7.57	15.9	2.98	2.39	0.80	0.67	3.7	4.41	3.80	0.74	3.1	36.7	4.11
	0.164	9.84	26.9	3.04	2.42	0.79	0.65	3.7	4.66	3.86	0.75	3.1	36.9	4.17
30.0	0.082	4.92	5.5	2.62	2.24	0.86	0.80	3.4	3.26	3.90	0.75	3.2	37.1	4.22
	0.126	7.57	15.2	2.76	2.30	0.83	0.75	3.5	3.67	4.03	0.75	3.3	37.6	4.36
	0.164	9.84	25.5	2.83	2.33	0.82	0.73	3.6	3.87	4.08	0.75	3.3	37.9	4.42
35.0	0.082	4.92	4.8	2.41	2.16	0.90	0.88	3.3	2.74	Operation Not Recommended				
	0.126	7.57	14.5	2.54	2.21	0.87	0.83	3.4	3.05					
	0.164	9.84	24.8	2.60	2.24	0.86	0.81	3.4	3.21					
40.0	0.082	4.92	4.8	2.22	2.09	0.94	0.95	3.2	2.34					
	0.126	7.57	13.8	2.33	2.13	0.91	0.91	3.2	2.57					
	0.164	9.84	24.1	2.39	2.15	0.90	0.89	3.3	2.68					
45.0	0.082	4.92	4.8	2.07	2.07	1.00	1.01	3.1	2.05					
	0.126	7.57	13.8	2.15	2.08	0.97	0.98	3.1	2.21					
	0.164	9.84	24.1	2.19	2.09	0.95	0.96	3.2	2.29					

LEGEND

ARHI	Air Conditioning Heating, and Refrigeration Institute
db	Dry Bulb
COP	Coefficient of Performance
Cv	Coefficient of Velocity
EAT	Entering Air Temperature (C)
EER	Energy Efficiency Ratio
EWT	Entering Water Temperature (C)
HC	Heating Capacity (kW)
HE	Heat of Extraction (kW)
HR	Heat of Rejection (kW)
ISO	International Organization for Standardization
LAT	Latent Heat (kW)
MOPD	Maximum Opening Pressure Difference
SC	Sensible Capacity (kW)
S/T	Sensible/Total
TC	Total Capacity (kW)
wb	Wet Bulb
WPD	Water Pressure Differential

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 27 C db and 19 C wb in cooling and 20 C db in heating.
3. AHRI/ISO certified conditions are 27 C db 19 C wb in cooling and 20 C db in heating.
4. Table does not reflect fan or pump power connections for AHRI/ISO conditions.
5. All performance data is based upon the lower voltage of dual voltage rated units.
6. Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
7. Operation below 4 C EWT is based on 15% methanol antifreeze solution.
8. Operation below 16 C EWT requires optional insulated water/refrigerant circuit.
9. See performance correction tables for operating conditions other than those listed above.
10. Shaded area refers to calculations required to determine if heating water flow is sufficient for the non-antifreeze systems.

WPD ADDER FOR MOTORIZED VALVE,

50PEC12 UNIT

(Cv = 4.9, MOPD = 862 kPa)

L/s	WPD Adder (kPa)
0.07	2.1
0.10	4.1
0.14	8.3

Performance data (cont)



50PEC15 — NOMINAL AIRFLOW 198 L/s HEATING AND 189 L/s COOLING

EWT (C)	FLOW		WPD (kPa)	COOLING - EAT 27/19 C					HEATING - EAT 20 C					
	L/s	L/m		TC (kW)	SC (kW)	S/T Ratio	Power (kW)	HR (kW)	EER	HC (kW)	Power (kW)	HE (kW)	LAT (C)	COP
-5.0	0.189	11.36	22.8	Operation Not Recommended					2.25	0.71	1.5	29.6	3.15	
0.0	0.095	5.68	4.8	4.26	3.20	0.75	0.48	4.74	8.95	2.48	0.73	1.7	30.6	3.39
	0.145	8.71	12.4	4.30	3.22	0.75	0.42	4.72	10.14	2.58	0.74	1.8	31.0	3.50
	0.189	11.36	20.7	4.29	3.23	0.75	0.40	4.69	10.79	2.64	0.74	1.9	31.3	3.56
5.0	0.095	5.68	4.1	4.15	3.15	0.76	0.54	4.69	7.63	2.83	0.75	2.1	32.1	3.76
	0.145	8.71	11.0	4.24	3.19	0.75	0.49	4.73	8.63	2.96	0.76	2.2	32.6	3.88
	0.189	11.36	19.3	4.27	3.21	0.75	0.47	4.74	9.18	3.02	0.77	2.3	32.9	3.95
10.0	0.095	5.68	3.8	3.98	3.08	0.77	0.61	4.59	6.49	3.18	0.77	2.4	33.6	4.11
	0.145	8.71	9.7	4.11	3.14	0.76	0.56	4.67	7.34	3.33	0.78	2.5	34.2	4.24
	0.189	11.36	18.6	4.17	3.16	0.76	0.53	4.70	7.81	3.40	0.79	2.6	34.5	4.32
15.0	0.095	5.68	3.4	3.76	3.00	0.80	0.68	4.45	5.51	3.53	0.80	2.7	35.1	4.44
	0.145	8.71	9.0	3.92	3.06	0.78	0.63	4.56	6.22	3.69	0.80	2.9	35.8	4.59
	0.189	11.36	17.2	4.00	3.09	0.77	0.60	4.60	6.62	3.78	0.81	3.0	36.1	4.67
20.0	0.095	5.68	2.8	3.53	2.90	0.82	0.76	4.28	4.65	3.87	0.81	3.1	36.5	4.76
	0.145	8.71	8.3	3.70	2.97	0.80	0.70	4.40	5.25	4.05	0.82	3.2	37.3	4.93
	0.189	11.36	15.9	3.78	3.00	0.79	0.68	4.46	5.59	4.15	0.83	3.3	37.7	5.02
25.0	0.095	5.68	2.8	3.27	2.79	0.85	0.84	4.11	3.90	4.22	0.83	3.4	38.0	5.07
	0.145	8.71	8.3	3.45	2.87	0.83	0.78	4.23	4.40	4.42	0.84	3.6	38.9	5.26
	0.189	11.36	15.2	3.54	2.90	0.82	0.75	4.29	4.69	4.52	0.85	3.7	39.3	5.35
30.0	0.095	5.68	2.8	3.01	2.68	0.89	0.92	3.93	3.26	4.56	0.85	3.7	39.5	5.38
	0.145	8.71	7.6	3.18	2.75	0.87	0.87	4.05	3.67	4.78	0.86	3.9	40.4	5.58
	0.189	11.36	14.5	3.27	2.79	0.85	0.84	4.11	3.90	4.90	0.86	4.0	40.9	5.69
35.0	0.095	5.68	2.8	2.76	2.57	0.93	1.02	3.77	2.71	Operation Not Recommended				
	0.145	8.71	7.6	2.92	2.64	0.91	0.96	3.87	3.04					
	0.189	11.36	13.8	3.00	2.68	0.89	0.93	3.93	3.23					
40.0	0.095	5.68	2.8	2.52	2.47	0.98	1.12	3.64	2.25					
	0.145	8.71	7.6	2.66	2.53	0.95	1.06	3.72	2.52					
	0.189	11.36	13.8	2.74	2.56	0.94	1.03	3.76	2.67					
45.0	0.095	5.68	2.8	2.31	2.39	1.03	1.23	3.55	1.87					
	0.145	8.71	7.6	2.43	2.43	1.00	1.17	3.59	2.08					
	0.189	11.36	13.8	2.49	2.46	0.99	1.13	3.63	2.20					

LEGEND

ARHI	Air Conditioning Heating, and Refrigeration Institute
db	Dry Bulb
COP	Coefficient of Performance
Cv	Coefficient of Velocity
EAT	Entering Air Temperature (C)
EER	Energy Efficiency Ratio
EWT	Entering Water Temperature (C)
HC	Heating Capacity (kW)
HE	Heat of Extraction (kW)
HR	Heat of Rejection (kW)
ISO	International Organization for Standardization
LAT	Latent Heat (kW)
MOPD	Maximum Opening Pressure Difference
SC	Sensible Capacity (kW)
S/T	Sensible/Total
TC	Total Capacity (kW)
wb	Wet Bulb
WPD	Water Pressure Differential

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 27 C db and 19 C wb in cooling and 20 C db in heating.
3. AHRI/ISO certified conditions are 27 C db 19 C wb in cooling and 20 C db in heating.
4. Table does not reflect fan or pump power connections for AHRI/ISO conditions.
5. All performance data is based upon the lower voltage of dual voltage rated units.
6. Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
7. Operation below 4 C EWT is based on 15% methanol antifreeze solution.
8. Operation below 16 C EWT requires optional insulated water/refrigerant circuit.
9. See performance correction tables for operating conditions other than those listed above.
10. Shaded area refers to calculations required to determine if heating water flow is sufficient for the non-antifreeze systems.

WPD ADDER FOR MOTORIZED VALVE,

50PEC15 UNIT

(Cv = 4.9, MOPD = 862 kPa)

L/s	WPD Adder (kPa)
0.07	2.1
0.10	4.1
0.14	8.3



50PEC18 — NOMINAL AIRFLOW 269 L/s HEATING AND 250 L/s COOLING

EWT (C)	FLOW		WPD (kPa)	COOLING - EAT 27/19 C						HEATING - EAT 20 C				
	L/s	L/m		TC (kW)	SC (kW)	S/T Ratio	Power (kW)	HR (kW)	EER	HC (kW)	Power (kW)	HE (kW)	LAT (C)	COP
-5.0	0.215	12.87	32.4	Operation not Recommended						2.49	0.79	1.7	28.4	3.14
0.0	0.120	7.19	9.0	4.31	3.33	0.77	0.80	5.1	5.36	2.71	0.80	1.9	29.1	3.36
	0.145	8.71	15.2	4.32	3.34	0.77	0.77	5.1	5.59	2.77	0.81	2.0	29.3	3.42
5.0	0.215	12.87	30.3	4.32	3.37	0.78	0.73	5.1	5.94	2.87	0.82	2.1	29.7	3.51
	0.120	7.19	8.3	4.24	3.28	0.77	0.89	5.1	4.76	3.09	0.84	2.3	30.4	3.69
	0.145	8.71	13.8	4.27	3.30	0.77	0.86	5.1	4.99	3.16	0.84	2.3	30.7	3.76
10.0	0.215	12.87	28.3	4.31	3.32	0.77	0.81	5.1	5.35	3.29	0.85	2.4	31.1	3.86
	0.120	7.19	6.9	4.13	3.22	0.78	0.99	5.1	4.18	3.50	0.87	2.6	31.8	4.00
	0.145	8.71	12.4	4.18	3.24	0.78	0.95	5.1	4.40	3.59	0.88	2.7	32.1	4.07
15.0	0.215	12.87	26.2	4.24	3.28	0.77	0.89	5.1	4.75	3.75	0.90	2.9	32.6	4.17
	0.120	7.19	6.2	3.98	3.16	0.79	1.09	5.1	3.64	3.92	0.91	3.0	33.2	4.28
	0.145	8.71	11.0	4.04	3.18	0.79	1.05	5.1	3.84	4.03	0.93	3.1	33.6	4.35
20.0	0.215	12.87	24.8	4.13	3.22	0.78	0.99	5.1	4.17	4.21	0.94	3.3	34.2	4.47
	0.120	7.19	5.5	3.80	3.09	0.81	1.21	5.0	3.15	4.34	0.95	3.4	34.6	4.54
	0.145	8.71	10.3	3.87	3.11	0.80	1.16	5.0	3.33	4.46	0.97	3.5	35.0	4.62
25.0	0.215	12.87	23.4	3.98	3.16	0.79	1.10	5.1	3.62	4.66	0.98	3.7	35.7	4.74
	0.120	7.19	4.8	3.60	3.00	0.83	1.33	4.9	2.70	4.75	0.99	3.8	36.0	4.79
	0.145	8.71	9.7	3.67	3.03	0.83	1.28	5.0	2.86	4.87	1.00	3.9	36.4	4.87
30.0	0.215	12.87	22.1	3.79	3.08	0.81	1.21	5.0	3.12	5.07	1.01	4.1	37.1	5.00
	0.120	7.19	4.1	3.37	2.89	0.86	1.46	4.8	2.30	5.12	1.02	4.1	37.3	5.04
	0.145	8.71	9.0	3.45	2.93	0.85	1.41	4.9	2.44	5.25	1.02	4.2	37.7	5.13
35.0	0.215	12.87	20.7	3.58	2.99	0.84	1.34	4.9	2.67	5.44	1.03	4.4	38.3	5.28
	0.120	7.19	4.1	3.12	2.77	0.89	1.60	4.7	1.94	Operation not Recommended				
	0.145	8.71	9.0	3.21	2.82	0.88	1.55	4.8	2.06					
40.0	0.215	12.87	20.0	3.34	2.88	0.86	1.48	4.8	2.26					
	0.120	7.19	3.4	2.86	2.63	0.92	1.76	4.6	1.63					
	0.145	8.71	8.3	2.95	2.68	0.91	1.70	4.7	1.73					
45.0	0.215	12.87	19.3	3.08	2.76	0.89	1.63	4.7	1.90	Operation not Recommended				
	0.120	7.19	3.4	2.59	2.47	0.95	1.92	4.5	1.35					
	0.145	8.71	8.3	2.68	2.52	0.94	1.86	4.5	1.44					

LEGEND

ARHI	Air Conditioning Heating, and Refrigeration Institute
db	Dry Bulb
COP	Coefficient of Performance
Cv	Coefficient of Velocity
EAT	Entering Air Temperature (C)
EER	Energy Efficiency Ratio
EWT	Entering Water Temperature (C)
HC	Heating Capacity (kW)
HE	Heat of Extraction (kW)
HR	Heat of Rejection (kW)
ISO	International Organization for Standardization
LAT	Latent Heat (kW)
MOPD	Maximum Opening Pressure Difference
SC	Sensible Capacity (kW)
S/T	Sensible/Total
TC	Total Capacity (kW)
wb	Wet Bulb
WPD	Water Pressure Differential

NOTES:

1. Interpolation is permissible; extrapolation is not.
2. All entering air conditions are 27 C db and 19 C wb in cooling and 20 C db in heating.
3. AHRI/ISO certified conditions are 27 C db 19 C wb in cooling and 20 C db in heating.
4. Table does not reflect fan or pump power connections for AHRI/ISO conditions.
5. All performance data is based upon the lower voltage of dual voltage rated units.
6. Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
7. Operation below 4 C EWT is based on 15% methanol antifreeze solution.
8. Operation below 16 C EWT requires optional insulated water/refrigerant circuit.
9. See performance correction tables for operating conditions other than those listed above.
10. Shaded area refers to calculations required to determine if heating water flow is sufficient for the non-antifreeze systems.

WPD ADDER FOR MOTORIZED VALVE,

50PEC18 UNIT

(Cv = 4.9, MOPD = 862 kPa)

L/s	WPD Adder (kPa)
0.07	2.1
0.10	4.1
0.14	8.3

Performance data (cont)



50PEC CONSOLE BLOWER PERFORMANCE

50PEC UNIT SIZE	RATED AIRFLOW (L/s)		AIRFLOW (L/s)		
	Heating	Cooling	Low Speed	Medium Speed	High Speed
09	151	142	146	127	113
12	184	175	175	142	118
15	189	198	189	170	149
18	269	250	250	212	179

LEGEND

AHRI — Air Conditioning, Heating, and Refrigeration Institute
 ISO — International Organization for Standardization

NOTES:

1. Fan speed is field adjustable.
2. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 208 v for 208-230 v units.
3. All units are AHRI/ISO 13256-1 rated on high fan speed.
4. All units are designed and rated for zero external static pressure (non-ducted) application.

Application data



Aquazone™ water source heat pump products are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop type systems. Use Aquazone products to provide optimal energy efficient solutions and adapt to the most challenging design requirements.

AQUAZONE PRODUCT GUIDE

50 SERIES	TYPE	APPLICATION
50HQP,VQP	Large Capacity	Environmentally sound unit with Puron® refrigerant (R-410A) designed to handle large zoned areas for all geothermal and boiler/tower applications.
50PC	Compact	Compact WSHP with Puron refrigerant (R-410A) for boiler/tower, ground water, or ground loop systems.
50PS	Premium Efficiency	Premium, ultra efficient unit with Puron refrigerant (R-410A) for new boiler/tower, ground water, or ground loop systems
50PEC	High Efficiency Console	Efficient console unit with Puron refrigerant (R-410A) and attractive design for finished interior, under-window installations.
50PSW	Water-to-Water	Efficient unit with Puron refrigerant (R-410A) serves as an alternative to pre-heat or cool air. Unit can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, design this system between 2.41 and 3.23 L/s per kW of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 15 and 35 C. Within this temperature range, units can heat or cool from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance designing water loop systems. The guide includes a practical approach for the latest and most current design recommendations including:

- Horizontal, vertical, console, rooftop and water-to-water product applications.
- Ventilation methods and system design including energy recovery.
- Acoustical considerations for different product types.
- Addressing IAQ issues such as condensate removal, humidity control.
- Air distribution design including diffuser selection/layout and ductwork design.
- Hydronic system design including pipe sizing/layout and boiler/tower sizing.
- Control configurations such as stand alone, DDC, DCV, and VVT®.
- WSHP efficiency/operational cost comparison chart.
- System variations such as a system without a boiler, variable pumping, and VAV for interior use.

Ground water systems

To use Aquazone units in ground water applications, the extended range should be specified. This will provide factory-installed coaxial coil insulation to prevent condensate from dripping when entering water temperatures are below 15.6 C. In addition, the copper coaxial coil installed on the Aquazone units may not be suitable for all water conditions. Refer to the Water Conditioning section for proper coaxial coil material selection.

Surface water system — This system is typically located near a lake or pond. In this application, the loop can be submerged in a series of coils beneath the water surface. The number of coils required depends on system load and design. This application requires minimum piping and excavation.

Open loop system — Use this system where ground water is plentiful. In this application, ground water is pumped through supply piping from the well to the building. The water is then pumped back into the ground through a discharge well as it leaves the building. An additional heat exchanger is usually installed between the building water piping system and the ground water piping system. This design limits piping and excavation.

Aquazone units include a standard TXV and are rated to extremely low temperatures to self-adjust the refrigeration circuit. Therefore, open loop systems do not require water regulating valves. Use a slow opening/closing solenoid valve to conserve water.

Ground loop systems

There are many commonly specified designs for ground loop applications. Typical designs include vertical loops and horizontal loops. In some applications, water is piped from the ground or lake directly to the water source heat pump. This system only requires piping to get the water from the source to the unit.

NOTE: When utilizing Aquazone water source heat pumps in ground loop systems, refer to the design considerations in the ground water system section.

Horizontal ground loop — Use this system when adequate space is available and trenching can be easily accomplished. A series of parallel pipes are laid out in trenches 3 to 6 feet below the ground surface, and then back-filled. Often, multiple pipes are used to maximize each trench's heat transfer capability. Ground conditions, heating and cooling requirements, and system design determine piping requirements and ground loop field size.

Vertical ground loop — Use this system in vertical bore-hole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum site disruption is desired. The vertical ground loop system contains a single loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

Hybrid systems — In some applications, it may be beneficial to incorporate a cooling tower into the ground loop

Application data (cont)



system to reduce the overall cost. A hybrid system discards excess heat into the air and increases the cooling performance of the ground loop.

Condensate drainage

Connect the console unit condensate drain to the building condensate drain with a flexible, non-pressure rated plastic hose. Be sure to avoid kinks in this hose to ensure an unobstructed flow of condensate from the unit to the drain. The condensate hose's horizontal run is usually too short to pose any drainage problems, however, make sure this line is pitched at least 1 mm for every 0.5 m of run (in the direction of the flow.) Avoid low points and unpitched piping since dirt collects in these areas and may cause stoppage and overflow.

Installing a trap or drain in the field is not required unless specified by local codes. The 50PEC units are designated in a blow-thru configuration. The condensate drain pan is located on the outlet side of the blower so that the pressure in the drain pan is higher than the atmospheric pressure.

Water conditioning

In some applications, maintaining proper water quality may require higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are important when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment depends on the water quality as well as system type. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths, such as algae, can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone™ WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a cupronickel heat exchanger for applications where water is outside the copper heat exchanger's standard contaminant limits.

WATER QUALITY GUIDELINES

CONDITION	ACCEPTABLE LEVEL		
pH	7 to 9 range for copper. Cupronickel may be used in the 5 to 9 range.		
Total Hardness	Calcium and magnesium carbonate should not exceed 20 grains per gallon (350 ppm).		
Iron Oxides	Less than 1 ppm.		
Iron Bacteria	No level allowable.		
Corrosion*	Ammonia, Ammonium Hydroxide Ammonium Chloride, Ammonium Nitrate Ammonium Sulfate Chlorine/Chlorides Hydrogen Sulfide†	Max Allowable Level 0.5 ppm 0.5 ppm 0.5 ppm 0.5 ppm None Allowable	Coaxial Metal Cu Cu Cu CuNi —
Brackish	Use Cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

*If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

†Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

NOTE: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

Acoustical design

Sound power levels represent the sound that the source, the WSHP unit, produces with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces. These goals help ensure that people can be comfortable and communicate effectively over the background noise of the air-conditioning system and other background noise sources.

Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented by noise criteria (NC) curves. Noise criteria (NC) curve levels represent a peak over a full frequency spectrum. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals.

It is important to know how to convert the unit ratings from sound power (Lw) to sound pressure (Lp). This conversion depends on the specifics of the installation's acoustical environment. Assessing an area's acoustical design requires that you compare the sound pressure (Lp) with the NC curve for the selected area.

The resulting calculations are compared to the NC curve selected for the area to assess the acoustical design.



Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- Type of acoustical ceiling
- Use of metal or flex duct
- Absorption in the occupied space
- Location in the occupied space
- Open or closed layout plan
- Use of open or ducted returns
- Orientation of unit to occupant
- Use of lined or unlined duct

OCTAVE BAND SOUND PRESSURE LEVEL (L_p) ASSOCIATED WITH NC CURVES

NOISE CRITERIA CURVES	OCTAVE BAND SOUND PRESSURE LEVEL (L _p)							
	Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
NC-15	49	36	26	17	17	14	12	11
NC-20	52	41	33	27	22	19	17	16
NC-25	54	45	38	31	27	24	22	21
NC-30	58	49	41	36	31	29	28	27
NC-35	61	53	45	40	36	34	33	32
NC-40	64	57	50	45	41	39	38	37
NC-45	67	61	54	49	46	44	43	42
NC-50	71	64	58	54	51	49	48	47
NC-55	74	68	63	58	56	54	53	52
NC-60	77	71	67	63	61	59	58	57
NC-65	80	75	71	68	66	64	63	62

WSHP sound control

Analyzing the projected sound level in the conditioned space caused by a WSHP unit is quite involved. The key is to have good sound power ratings (L_w) in dB on the equipment to determine the ductwork, ceiling and room sound attenuation effect.

Console units

With console units, the fan and compressor are located within the space, and only the casing design attenuates the transmission of sound sources into the space. The designer should carefully review the manufacturer's acoustical data when selecting console units and use lower fan speeds to minimize space noise.

Operating limits

Environment

This equipment is designed for indoor installation ONLY.

Power supply

A voltage variation of $\pm 10\%$ of nameplate utilization voltage is acceptable.

Starting conditions

The 50PEC unit will start and operate in an ambient temperature of 10.0 °C, with entering-air temperature at 10.0 °C, with entering-water temperature at 15.6 °C, with both air and water at the flow rates used in the AHRI/ISO Standard 13256-1 rating test, for initial start-up in winter.

NOTE: These are not normal or continuous operating conditions. Such a start-up should be used to bring the building space up to occupancy temperature.

AIR LIMITS

	50PEC UNIT	
	Cooling (C)	Heating (C)
Min. Ambient Air	10.0	10.0
Rated Ambient Air	26.7	20.0
Max. Ambient Air	37.8	29.4
Min. Entering Air	10.0	10.0
Rated Entering Air, db/wb	26.7/18.9	20.0
Max. Entering Air, db/wb	37.8/27.8	26.7

WATER LIMITS

	50PEC UNIT	
	Cooling (C)	Heating (C)
Min. Entering Water	-1.1*	-6.6*
Normal Entering Water	29.4	21.1
Max. Entering Water	48.9	32.2

LEGEND

db — Dry Bulb

wb — Wet Bulb

*Requires optional extended range insulation package when operating below the dew point.

NOTES:

1. Minimum air and water conditions can only be used at AHRI/ISO 13256-1 flow rates.
2. The 50PEC units may have up two values at maximum or minimum with all other parameters at normal conditions.

Solenoid valves

In applications using variable flow pumping, solenoid valves can be factory installed and operated from the control board in the Aquazone™ WSHP unit.

Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (0 °C) must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Use design care when selecting both the type and concentrations of glycol due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions
- Loss of piping pressure may increase greatly, resulting in higher pumping costs
- Higher mixture viscosity may cause excess corrosion and wear on the entire system
- The water's acidity may be greatly increased, promoting corrosion

Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

Application data (cont)



COMPLETE C AND DELUXE D ELECTRONIC CONTROL FEATURES COMPARISON

FEATURES	COMPLETE C	COMPLETE C WITH LON	DELUXE D	DELUXE D WITH LON
BASIC FEATURES				
High and Low Refrigerant Pressure Protection	S	S	S	S
Water Coil Freeze Protection	S	S	S	S
True 24 VA Thermostat Signals	S	S	S	S
Thermostat Inputs Compatible with Triacs	S	S	S	S
Condensate Overflow Sensor	S	S	S	S
Anti-Short-Cycle Time Delay	S	S	S	S
Random Start	S	S	S	S
Alarm (selectable dry contact or 24 VA)	S	S	S	S
Water Valve Relay	S	S	S	S
Water Valve Relay with Compressor Delay	N/A	N/A	S	S
Emergency Shutdown	N/A	DDC	S	DDC
Night Setback with Override	N/A	DDC	S	DDC
Outdoor Air Damper Control	N/A	N/A	S	S
ADVANCED FEATURES				
Intelligent Reset	S	S	S	S
High and Low Voltage Protection	S	S	S	S
Air Coil Freeze Protection	S	S	S	S
Freeze Set Point Field Select (water, antifreeze)	S	S	S	S
Intelligent Reversing Valve Operation	N/A	DDC	S	S
High/Low Fan Speed Outputs	N/A	N/A	S	S
Intelligent Fan Speed Control	N/A	N/A	S	S
Thermostat Type Select (Y,O or Y,W)	N/A	N/A	S	N/A
Reversing Valve Signal Select (O or B)	N/A	N/A	S	N/A
Dehumidistat Input	N/A	N/A	S	S
Reheat Dehumidification Control	N/A	N/A	O	O
Multiple Units on One Thermostat/Wall Sensor	N/A	DDC	S	DDC
SERVICE AND RELIABILITY FEATURES				
Service Test Mode	S	S	S	S
LED Fault and Status Lights	S	S	S	S
Fault Memory After Reset	S	S	S	S
Unit Performance Sentinel	S	S	S	S
Harness-Type Factory Wiring Connections	S	S	S	S
Fully Noise-Tested Design	S	S	S	S
CE Approval	S	S	S	S
Removable Low Voltage Connector	N/A	N/A	S	S
DDC/ENERGY MANAGEMENT FEATURES				
LONWorks (LONMark Compliant) Controller	N/A	S	N/A	S
Leaving Air and Water Temperature Sensor	N/A	S	N/A	S
Digital Wall Sensor	N/A	O	N/A	O

LEGEND

Complete C	— Complete C Control System	LON	— Local Operating Network
DDC	— Direct Digital Controls	N/A	— Not Available
Deluxe D	— Deluxe D Control System	O	— Optional
IAQ	— Indoor Air Quality	S	— Standard

Electrical data



50PEC UNIT SIZE	VOLTAGE CODE	V-Ph-Hz	MIN/MAX VOLTAGE	COMPRESSOR			FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMPS	MAX FUSE/ HACR
				QTY	RLA	LRA				
09	7	220/240-1-50	198-264	1	3.2	17	0.4	3.6	4.4	15.0
12	7	220/240-1-50	198-264	1	4.0	19	0.4	4.4	5.4	15.0
15	7	220/240-1-50	198-264	1	4.7	23	0.6	5.3	6.5	15.0
18	7	220/240-1-50	198-264	1	5.6	25	0.6	6.2	7.6	15.0

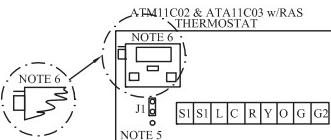
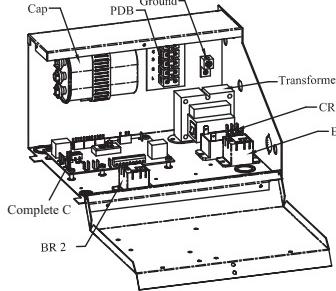
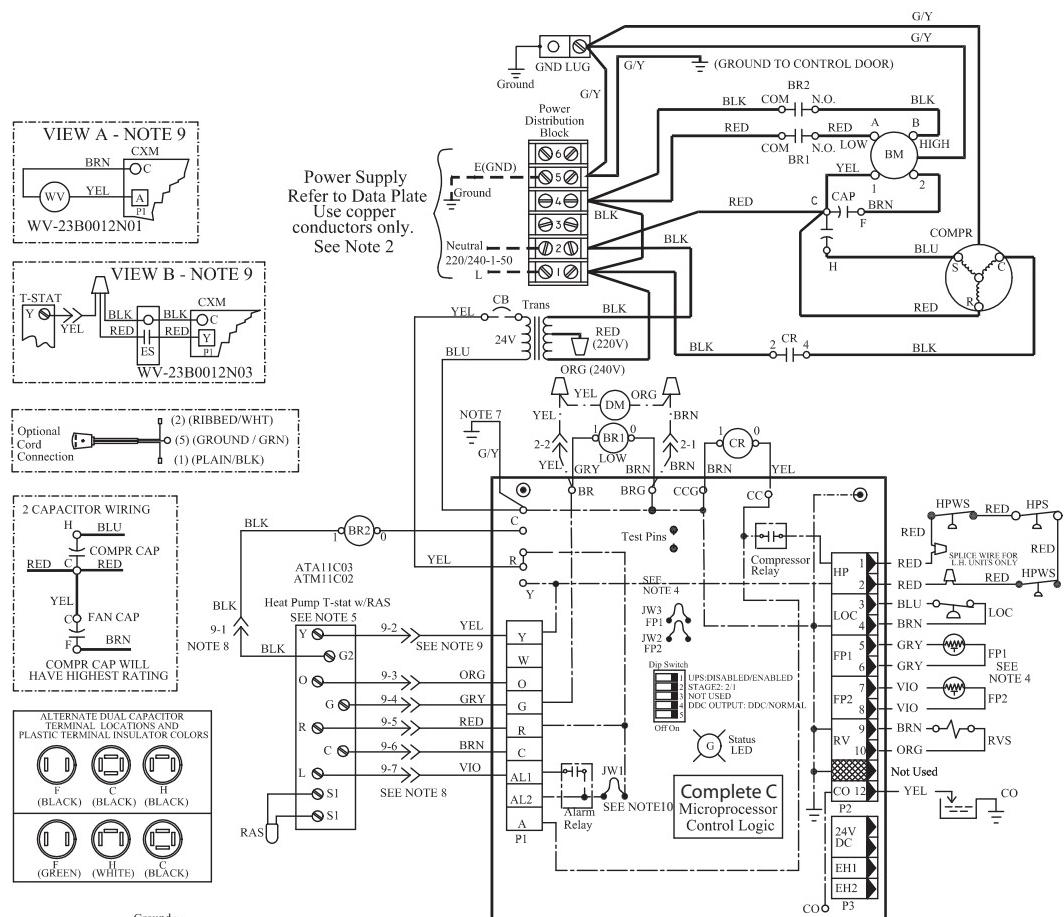
LEGEND

- FLA** — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
RLA — Rated Load Amps

Typical control wiring schematics

Carrier

50PEC UNIT MANUAL OR AUTO CHANGEOVER WITH COMPLETE C CONTROLLER WIRING



BLOWER MOTOR WIRING	
UNIT SIZE	POLE A POLE B

AL	— Alarm Relay Contacts
BM	— Blower Motor
BR	— Blower Relay
CAP	— Capacitor
CB	— Circuit Breaker
CO	— Sensor, Condensate Overflow
CR	— Compressor Relay
DM	— Damper Motor
ES	— End Switch
FP1	— Sensor, Water Coil Freeze Protection
FP2	— Sensor, Air Coil Freeze Protection
HPS	— High Pressure Switch
HPWS	— High Pressure Water Switch
JW1	— Jumper Wire for Alarm
LOC	— Loss of Charge Pressure Switch
PDB	— Power Distribution Block
RAS	— Return Air Sensor
RVS	— Reversing Valve Solenoid
TRANS	— Transformer
WV	— Water Valve
-----	Field Line Voltage Wiring
-----	Field Low-Voltage Wiring
-----	Printed Circuit Trace
-----	Option Low Voltage Wiring

Relay/Contactor Coil
Solenoid Coil
Thermistor
Circuit Breaker
Relay Contacts-N.O.
Switch-Temperature
Switch-High Pressure
Switch-Low Pressure
Ground
Wire Nut
Mate-N-Lok

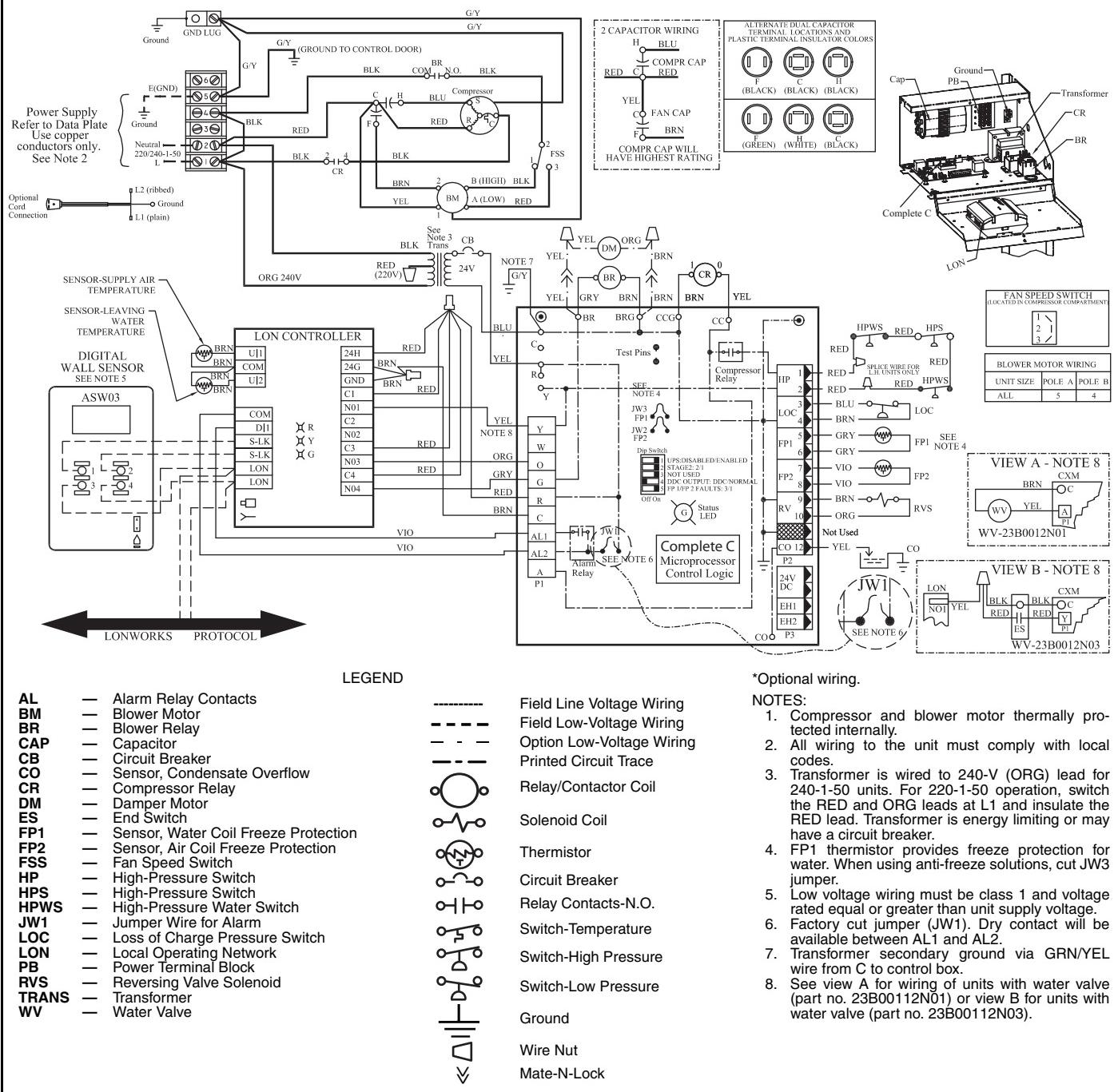
*Optional wiring.

†Registered trademark of AMP Incorporated.

NOTES:

1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with local codes.
3. Transformer is wired to 240-V (ORG) lead for 240-1-50 units. For 220-1-50 operation, switch the RED and ORG leads at L1 and insulate the RED lead. Transformer is energy limiting or may have a circuit breaker.
4. FP1 thermistor provides freeze protection for water. When using anti-freeze solutions, cut JW3 jumper.
5. For remote sensor, position jumper J1 on upper 2 pins.
6. For metric display, position jumper on 1 pin.
7. Transformer secondary ground via GRN/YEL wire from C to control box.
8. Mate-N-Lok† plug is optional.
9. See view A for wiring of units with water valve (part no. 23B00112N01) or view B for units with water valve (part no. 23B00112N03).
10. Factory cut jumper (JW1). Dry contact will be available between AL1 and AL2.

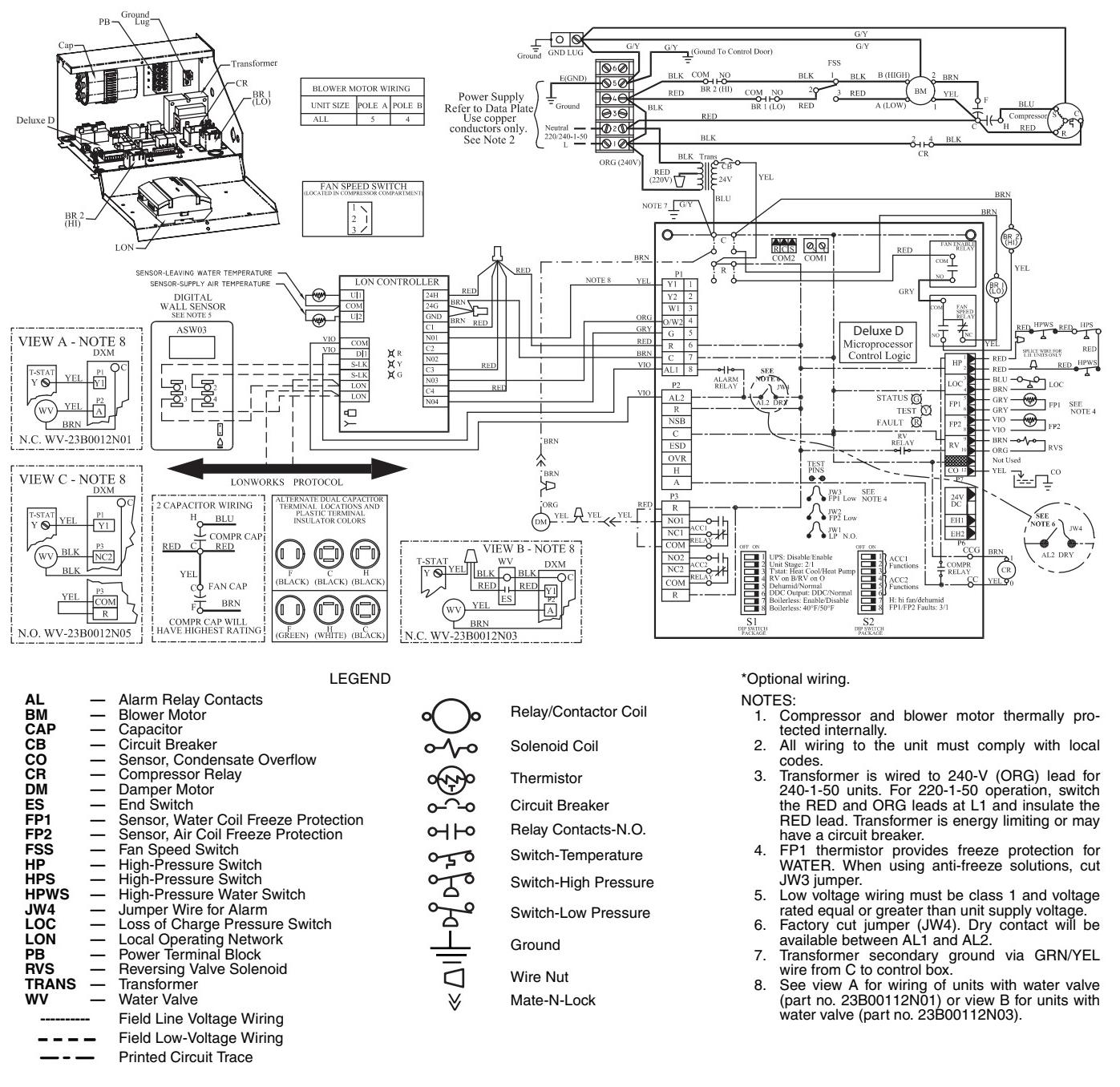
50PEC UNIT WITH COMPLETE C AND LON CONTROLLERS



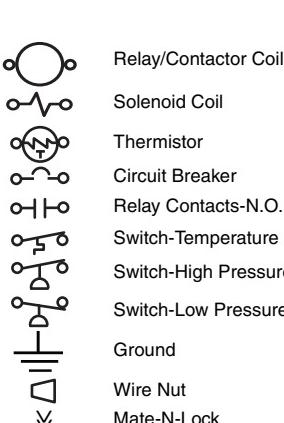
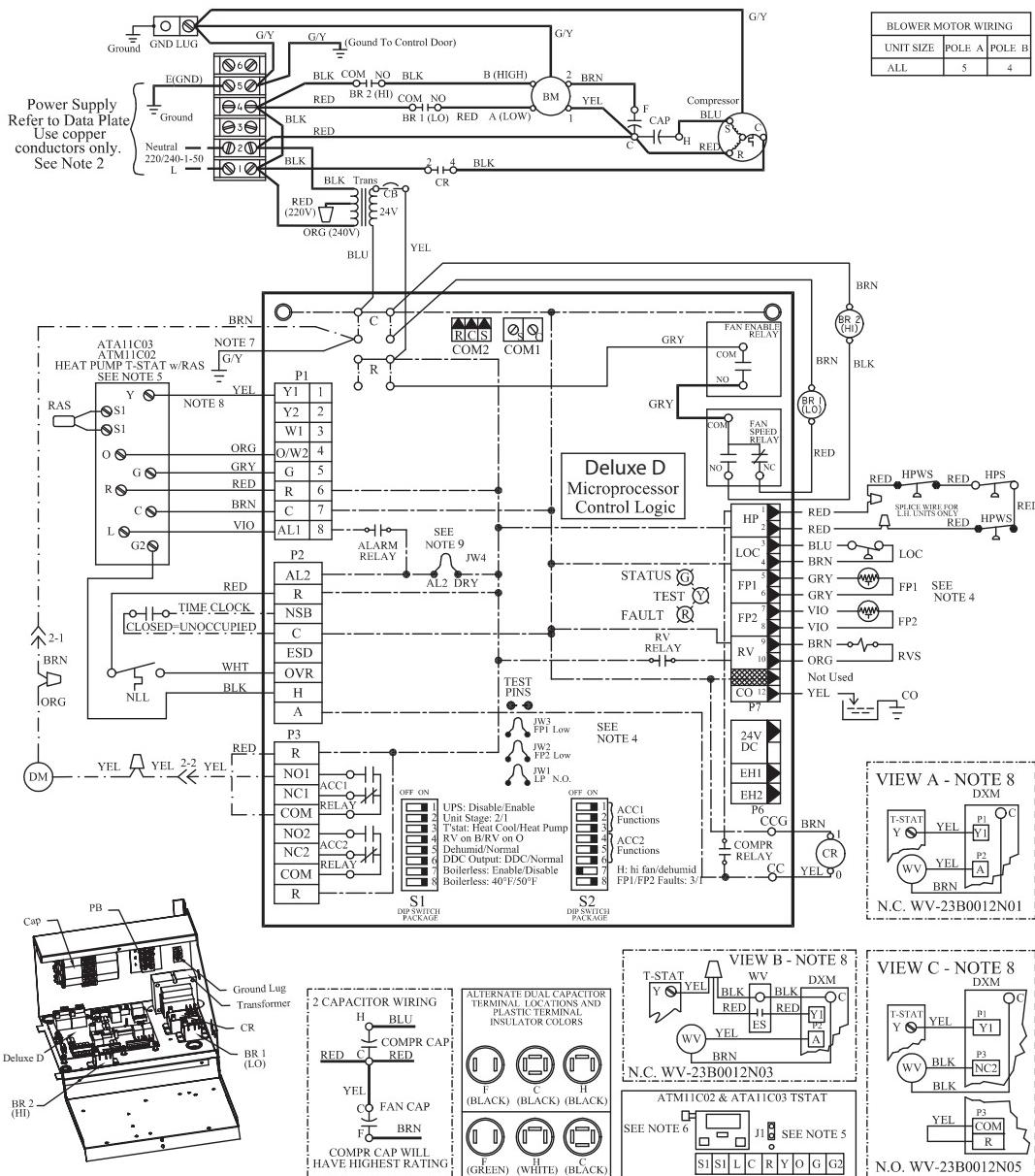
Typical control wiring schematics (cont)

The Carrier logo is located in the bottom right corner. It consists of the word "Carrier" in a stylized, italicized font, enclosed within an oval border. A small registered trademark symbol (®) is positioned at the bottom right of the oval.

50PEC UNIT WITH DELUXE D AND LON CONTROLLERS



50PEC UNIT WITH MANUAL OR AUTO CHANGEOVER AND DELUXE D CONTROLLER



*Optional wiring.

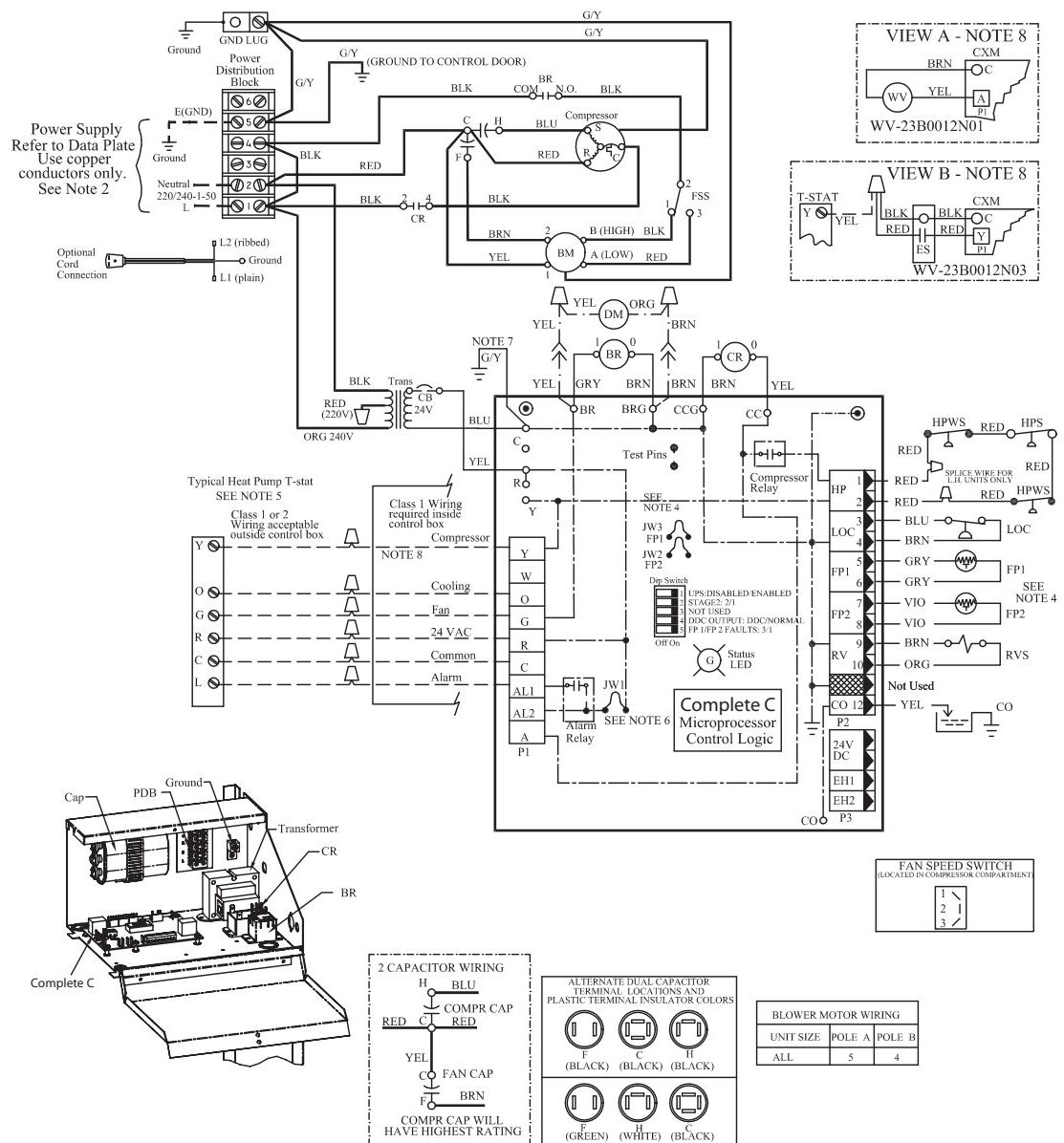
NOTES:

1. Compressor and blower motor thermally protected internally.
2. All wiring to the unit must comply with local codes.
3. Transformer is wired to 240-V (ORG) lead for 220-1-50 units. For 220-1-50 operation, switch the RED and ORG leads at L1 and insulate the RED lead. Transformer is energy limiting or may have a circuit breaker.
4. FP1 thermistor provides freeze protection for WATER. When using anti-freeze solutions, cut JW3 jumper.
5. For remote sensor, position jumper J1 on upper 2 pins.
6. For metric display, position jumper on 1 pin.
7. Transformer secondary ground via GRN/YEL wire from C to control box.
8. See view A for wiring of units with water valve (part no. 23B00112N01) or view B for units with water valve (part no. 23B00112N03).
9. Factory cut jumper (JW4). Dry contact will be available between AL1 and AL2.

Typical control wiring schematics (cont)

The Carrier logo is located in the bottom right corner. It consists of the word "Carrier" in a stylized, italicized font, enclosed within an oval border. A small registered trademark symbol (®) is positioned at the bottom right of the oval.

50PEC UNIT REMOTE-MOUNTED THERMOSTAT WITH COMPLETE C CONTROLLER WIRING



LEGEND

AL	—	Alarm Relay Contacts
BM	—	Blower Motor
BR	—	Blower Relay
CAP	—	Capacitor
CB	—	Circuit Breaker
CO	—	Sensor, Condensate Overflow
CR	—	Compressor Relay
DM	—	Damper Motor
ES	—	End Switch
FP1	—	Sensor, Water Coil Freeze P
FP2	—	Sensor, Air Coil Freeze Prote
FSS	—	Fan Speed Switch
HPS	—	High-Pressure Switch
HPWS	—	High-Pressure Water Switch
JW1	—	Jumper Wire for Alarm
LOC	—	Loss of Charge Pressure Sw
PDB	—	Power Distribution Block
RVS	—	Reversing Valve Solenoid
TRANS	—	Transformer
WV	—	Water Valve
-----	—	Field Line Voltage Wiring
-----	- - -	Field Low-Voltage Wiring

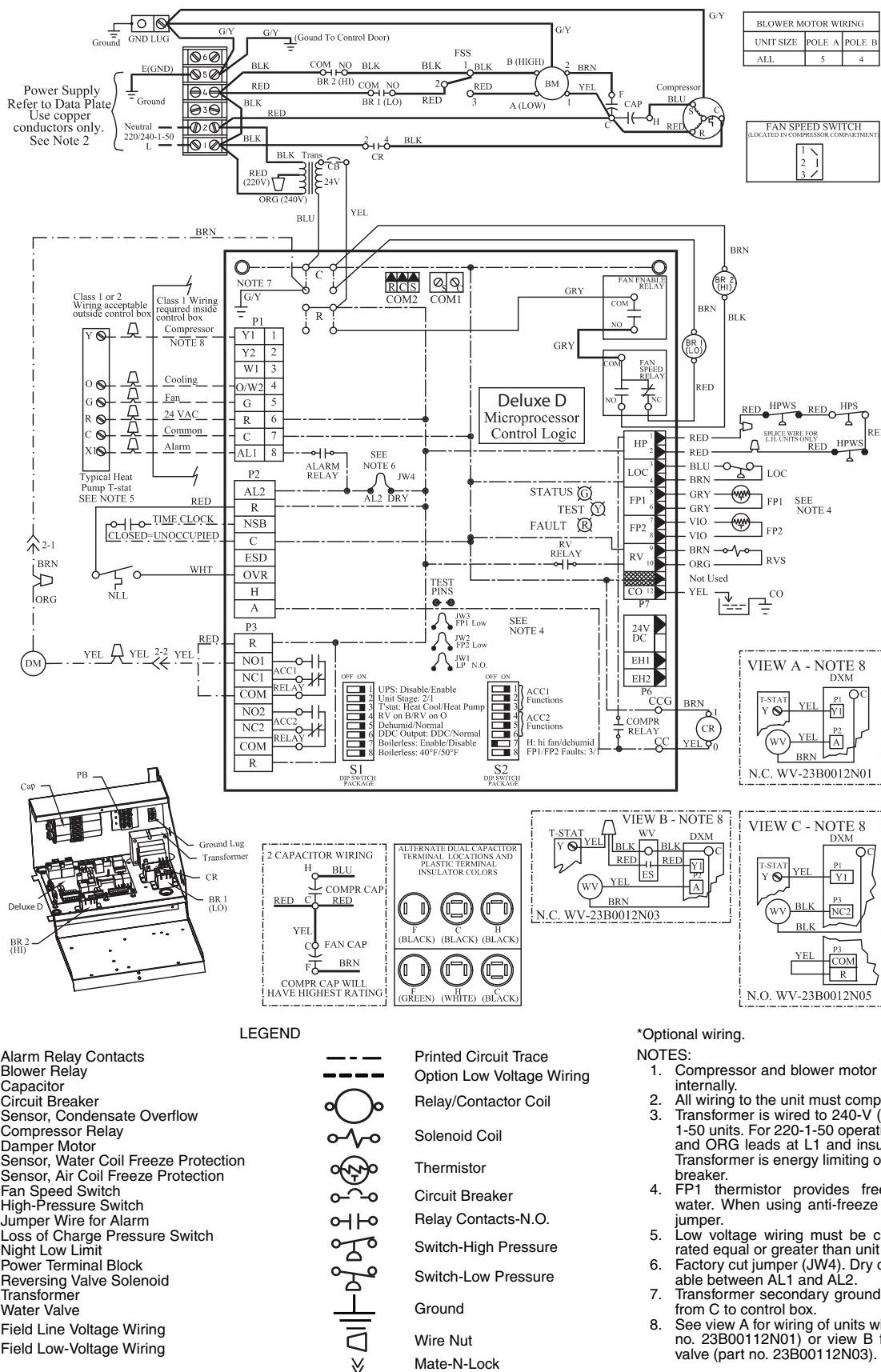
	Printed Circuit Trace
	Option Low Voltage Wiring
	Relay/Contactor Coil
	Solenoid Coil
	Thermistor
	Circuit Breaker
	Relay Contacts-N.O.
	Switch-High Pressure
	Switch-Low Pressure
	Ground
	Wire Nut
	Mate-N-Lock

*Optional wiring.

NOTES:

1. Compressor and blower motor thermally protected internally.
 2. All wiring to the unit must comply with local codes.
 3. Transformer is wired to 240-V (ORG) lead for 240-1-50 units. For 220-1-50 operation, switch the RED and ORG leads at L1 and insulate the RED lead. Transformer is energy limiting or may have a circuit breaker.
 4. FP1 thermistor provides freeze protection for water. When using anti-freeze solutions, cut JW3 jumper.
 5. Low voltage wiring must be class 1 and voltage rated equal or greater than unit supply voltage.
 6. Factory cut jumper (JW1). Dry contact will be available between AL1 and AL2.
 7. Transformer secondary ground via GRN/YEL wire from C to control box.
 8. See view A for wiring of units with water valve (part no. 23B00112N01) or view B for units with water valve (part no. 23B00112N03).

50PEC UNIT REMOTE-MOUNTED THERMOSTAT WITH DELUXE D CONTROLLER WIRING

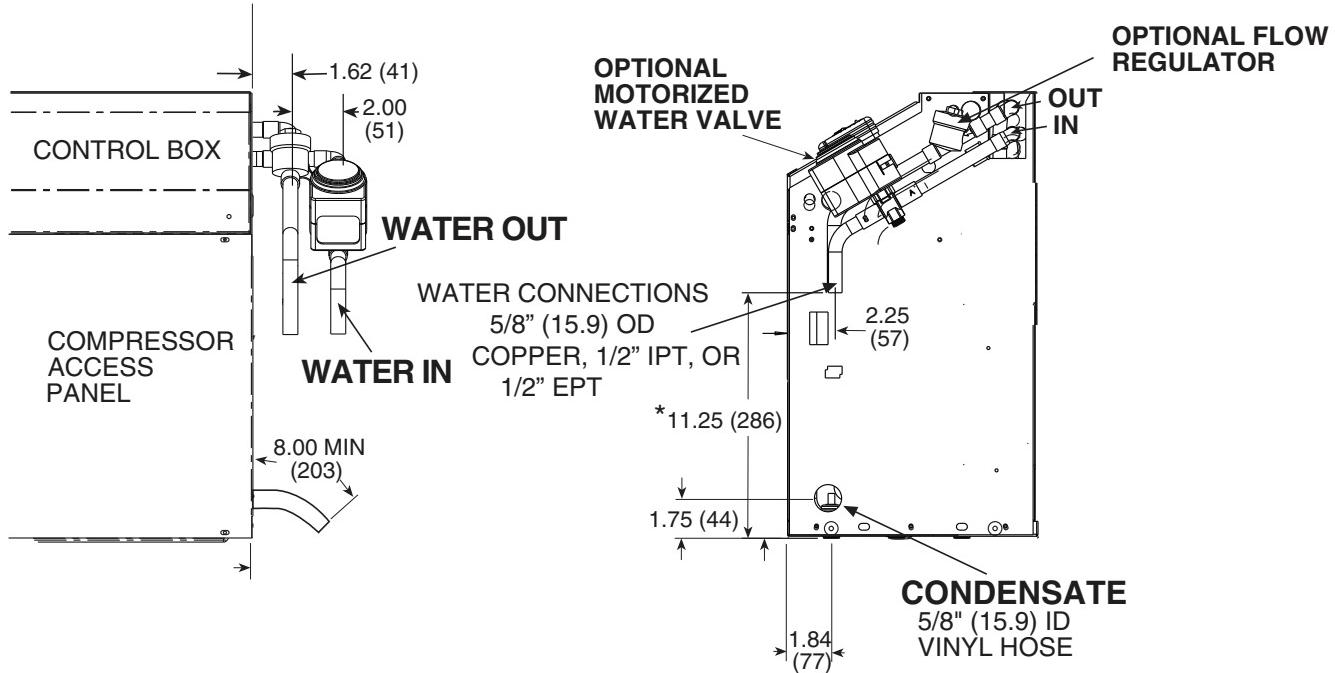


Typical piping

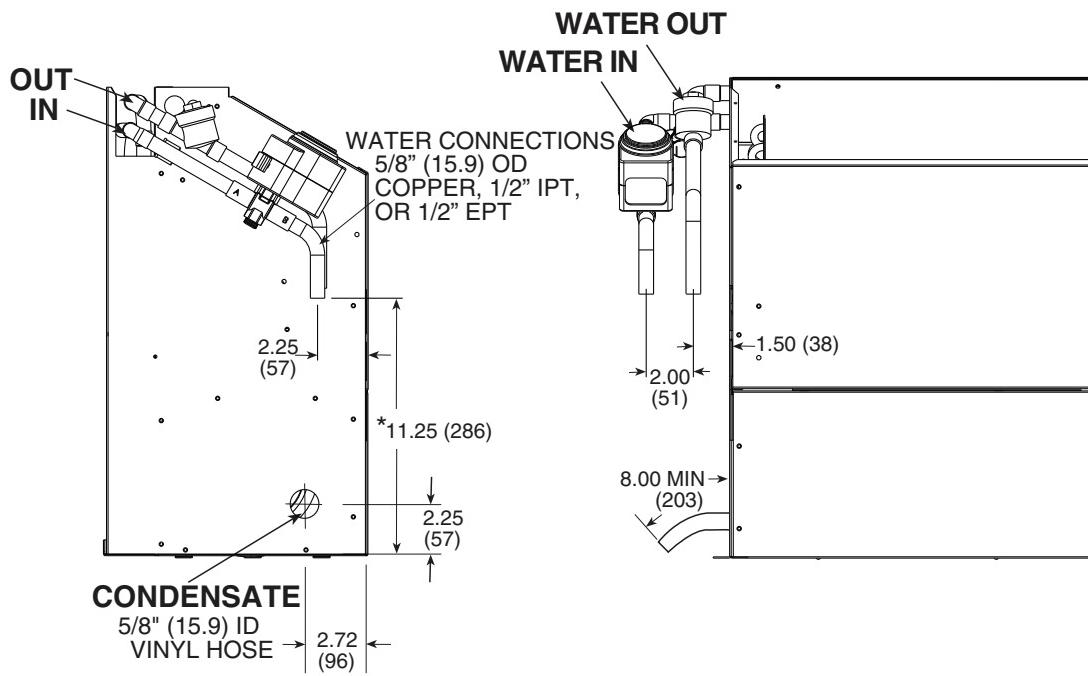


50PEC09-15 PIPING DIMENSIONS

RIGHT HAND CONFIGURATION



LEFT HAND CONFIGURATION



LEGEND

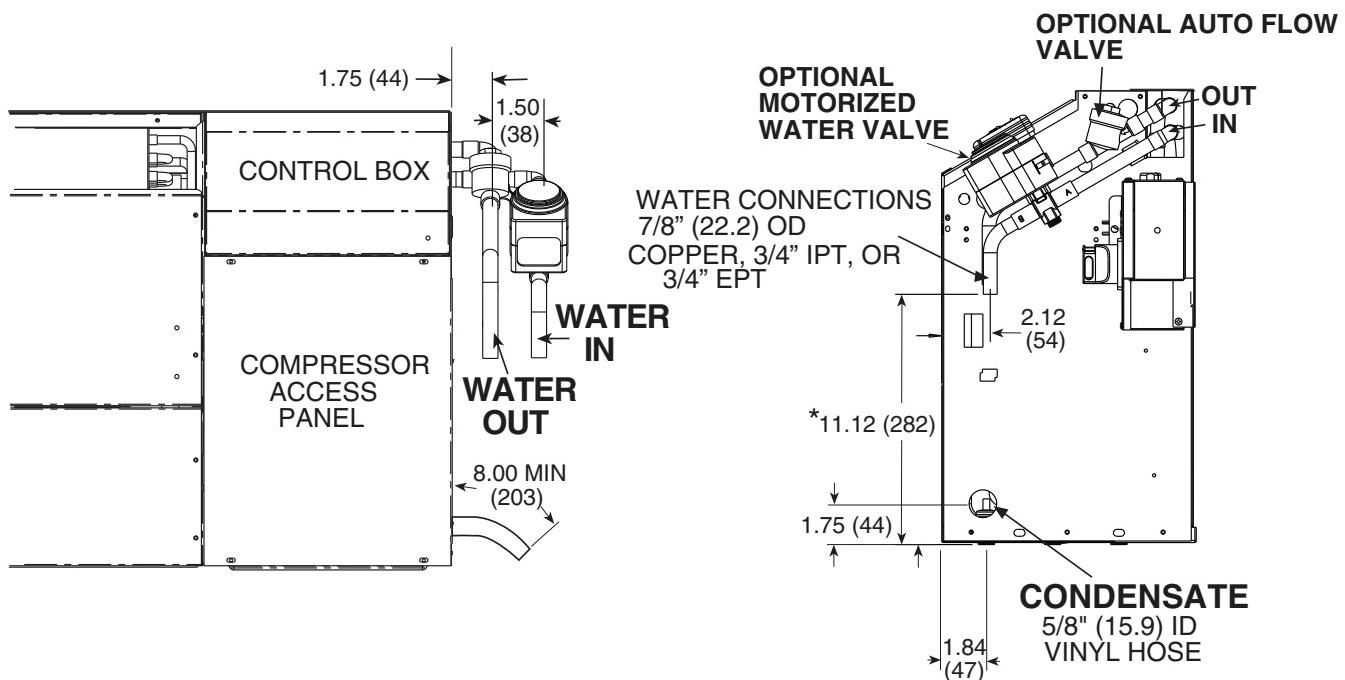
EPT — External Pipe Thread
IPT — Internal Pipe Thread

*Dimension reduced by fitting if selected.

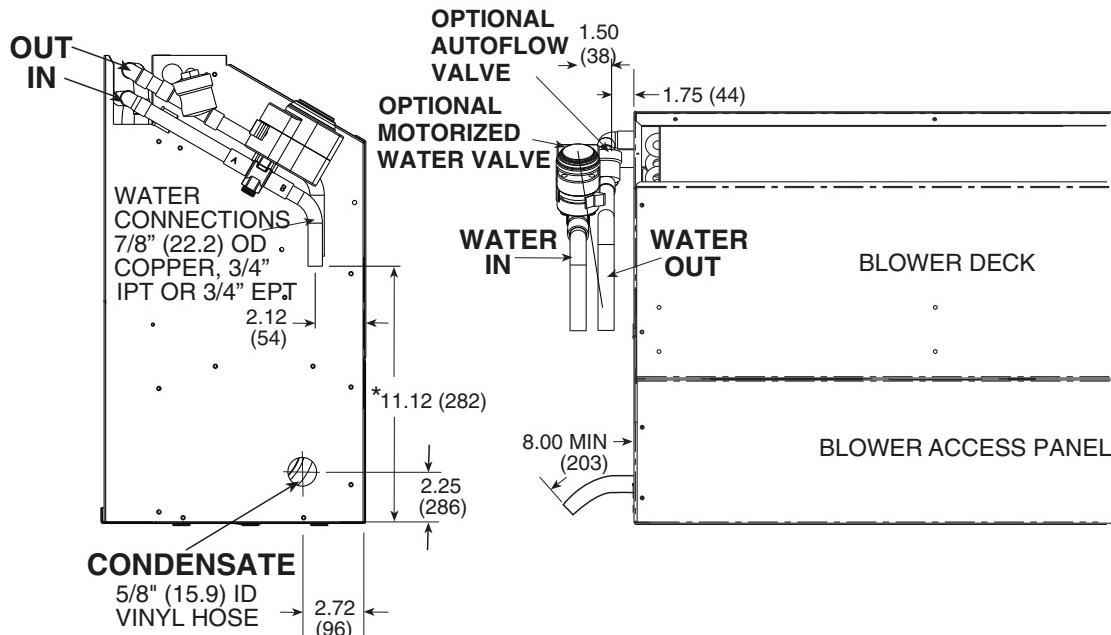
NOTE: Dimensions shown are in inches. Dimensions in parentheses are in millimeters.

50PEC18 PIPING DIMENSIONS

RIGHT HAND CONFIGURATION



LEFT HAND CONFIGURATION



LEGEND

EPT — External Pipe Thread
IPT — Internal Pipe Thread

*Dimension reduced by fitting if selected.

NOTE: Dimensions shown are in inches. Dimensions in parentheses are in millimeters.

Guide specifications



Console Water Source Heat Pumps

HVAC Guide Specifications

Size Range: **2.1 to 4.2 kW**
Cooling Capacity
1.7 to 4.5 kW
Heating Capacity

Carrier Model Number: **50PEC**

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Install water source heat pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow.
- B. Units shall be individually packaged with wooden skid covered with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

- A. All equipment listed in this section must be performance rated and certified in accordance with AHRI/ISO Standard 13256-1, latest edition, and safety listed in accordance with NRTL or CSA. All units shall have AHRI/ISO and NRTL or CSA labels and CE community mark.
- B. All units shall be factory tested under normal operating conditions at nominal water flow rates. Units which are tested without water flow are not acceptable. Standard operating range is 15.6 to 35.0 C entering water temperature.

Part 2 — Product

2.01 EQUIPMENT

A. Heat Pump Assembly:

Factory-tested and assembled single-piece packaged heating and cooling heat pump units shall be factory wired, charged with Puron® refrigerant (R-410A), contain refrigerant-to-water heat exchanger, air-to-refrigerant heat exchanger, 4-way reversing valve, fan motor assembly, compressor, thermostatic expansion valve (TXV) metering device, and all internal controls and safety devices.

B. Unit Cabinet:

1. The cabinet shall be constructed of heavy gage steel with welded corner bracing. A removable front cabinet allows easy service access to the chassis. The cabinet shall have a 30-degree sloped top with an aluminum rigid bar type discharge grille.
2. An access door shall be provided to cover the swing down control section.
3. Options include a locking control panel for added security; a bottom or front return with left or right hand configurations for ease of installation. Available with 127 mm subbase (bottom return units only), with or without motorized damper.
4. The cabinet shall be powder painted.

5. Optional mute package shall consist of additional sound attenuating materials strategically applied to the compressor compartment, and substitution of 13 mm noise dampening insulation for all surfaces that normally have 6 mm insulation. Insulation shall meet NFPA 90A requirements (U.S.A. Standard).

C. Fan and Motor Assembly:

The fan motors shall be multi-speed permanently lubricated, PSC (permanent split capacitor) type with thermal overload protection. To facilitate field service all units shall have a slide-out fan deck and quick electrical disconnect.

D. Refrigerant Components:

1. Units shall have a sealed refrigerant circuit including a rotary compressor, a refrigerant metering device, a finned tube refrigerant-to-air heat exchanger, a reversing valve, a coaxial (tube-in-tube) refrigerant-to-water heat exchanger, and safety controls including a high-pressure sensor, a loss-of-charge sensor to protect against loss of refrigerant, and low water temperature (freeze-stat) sensor.
2. Rotary compressors shall have thermal overload protection and shall be located in an insulated compartment to minimize sound transmission. Units shall have the compressor mounted on isolators to reduce noise and vibration transmission.
3. Refrigerant-to-air heat exchangers shall utilize enhanced aluminum fins and rifled copper tube construction rated to withstand 4137 kPa refrigerant working pressure.
4. Refrigerant-to-water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design rated to withstand 4137 kPa working refrigerant pressure.
5. Drain pan shall be constructed of galvanized steel and have powder coated application to inhibit corrosion.
6. Reversing valve shall be four-way solenoid-activated refrigerant valves which shall fail to heating operation. If the unit fails to cool a low-temperature thermostat must be provided to prevent over-cooling of the room.
7. Optional coaxial water-to-refrigerant heat exchangers shall be cupronickel.
8. Optional extended range for units operating with entering water temperatures below dew point. For use in operating range with entering water temperatures from -6.7 to 48.9 C.

E. Controls and Safeties:

Units which may be reset at the disconnect switch only shall not be acceptable.



1. Electrical:

A control box shall be located within the unit and shall contain controls for compressor, reversing valve and fan motor operation.

2. Piping:

- a. Copper tubes with a 5/8-in. OD dimension shall be provided on the supply and return water connections for the purpose of forming a sweat connection to field-supplied distribution piping.
- b. Optional threaded connections: A 1/2-in. male or female pipe threaded fitting shall be factory mounted on the supply and return water connections.

3. Unit Controls:

Safety devices on all units shall include low-pressure sensor or loss-of-charge switch, high-pressure switch, low water temperature sensor, and condensate overflow switch.

4. The standard Complete C electronic control system shall interface with the unit mounted or remote heat pump (Y,O) wall thermostat (mechanical or electronic). The control system shall have the following features:

- a. 50 va transformer.
- b. Anti-short cycle time delay on compressor operation; time delay shall be 5 minutes minimum.
- c. Random start on power-up.
- d. Low voltage protection.
- e. High voltage protection.
- f. Condensate overflow shutdown.
- g. Unit shutdown on low refrigerant pressures.
- h. Unit shutdown on high or low water temperature (selectable for antifreeze solutions).
- i. Option to reset unit at thermostat or disconnect. Fault type shall be retained in memory if reset at thermostat.
- j. Automatic intelligent reset. Unit shall automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, then lockout will occur.
- k. Ability to defeat time delays for servicing.
- l. Light-emitting diode (LED) to indicate high pressure, low pressure, improper voltage, water coil freeze protection, air coil freeze protection, condensate overflow, and control status.
- m. Unit performance monitor to indicate inefficient operating conditions prior to unit lockout.
- n. Remote fault type indication at thermostat.
- o. Single harness connection for all safety devices.

p. Selectable 24-v or pilot duty dry contact alarm output.

q. 24-v output to cycle a motorized water valve with compressor contactor.

r. The control box components shall be easily accessible with a swing out control compartment.

s. Standard unit-mounted MCO (manual changeover) thermostat operating controls shall consist of temperature setting dial knob, push button switches for Stop, Fan only, Hi Cool, Lo Cool, Hi Heat, Lo Heat. Unit-mounted thermostats shall have a remote sensor for sensing the return-air temperature.

5. The optional Deluxe D electronic control shall have all the features of the Complete C control, with the following additional features:

- a. 75 va transformer.
- b. A removable thermostat connector.
- c. Random start on return from night setback.
- d. Minimized reversing valve operation for extended life and quiet operation.
- e. Night setback control from low temperature thermostat, with 2-hour override initiated by a momentary signal from the thermostat.
- f. Dry contact night setback output for digital night setback thermostats.
- g. Ability to work with heat/cool (Y, W) thermostats.
- h. Ability to work with heat pump thermostats using O or B reversing valve control.
- i. Single grounded wire to initiate night setback or emergency shutdown.
- j. Boilerless system control can switch automatically to electric heat at low loop water temperature.
- k. Control board shall allow up to 3 units to be operated from one thermostat without any auxiliary controls.
- l. A relay to operate an external damper. The control to be such that the damper will not open until 30 minutes after the unit comes back from Unoccupied mode.
- m. Fan speed selection at thermostat.
- n. A relay to restart a central pump or control a 24-v motorized water valve.
- o. Intelligent fan speed selection based upon thermostat demand and/or dehumidistat signal.

6. LonWorks Interface System:

Units shall have all features listed above (either Complete C or Deluxe D) and the control board shall be supplied with a LonWorks interface board, which is LONMark certified. This will permit all units to be daisy chained via a 2-wire

Guide specifications (cont)



twisted pair shielded cable. The following points must be available at a central or remote computer location:

- a. space temperature
- b. leaving-water temperature
- c. discharge-air temperature
- d. command of space temperature set point
- e. cooling status
- f. heating status
- g. low temperature sensor alarm
- h. low pressure sensor alarm
- i. high pressure switch alarm
- j. condensate sensor alarm
- k. high/low voltage alarm
- l. fan "ON/AUTO" position of space thermostat
- m. unoccupied / occupied command
- n. cooling command
- o. heating command
- p. fan "ON / AUTO" command
- q. fault reset command
- r. itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75 va control transformer with load side short circuit and overload protection via a built in circuit breaker.

7. Optional Controls:

- a. Unit-mounted ACO (automatic changeover) thermostat operating controls shall consist of temperature setting dial knob, push button switches for Stop, Fan only, Hi fan, Lo fan. Unit-mounted thermostats shall have a remote sensor for sensing the return-air temperature.
- b. Units designed for connection to remote wall mounted thermostat shall be wired such that the operating controls are at the thermostat. The controller shall be provided with a low voltage field wiring terminal block. The control scheme shall accommodate MCO or ACO heat pump thermostats with Y, G, and O outputs. An alternate controller shall be available from the factory to accommodate the Heat/Cool thermostats.
- c. Motorized (2-way) water valves shall be factory installed and wired. The valve shall remain open when there is a cooling or heating demand and the compressor is running. The valve shall close when the compressor stops after satisfying the demand or due to lockout condition.
- d. Fresh air dampers shall be motorized with a spring return. The damper shall open when Cooling or Heating mode selection is made from the unit-mounted switches. With a

remote thermostat, the damper shall open any time the fan is in operation.

- e. Night low limit thermostats shall include a unit-mounted thermostat sensing space temperature. Should the space temperature fall below the limit, the night low limit thermostat shall start the fan and compressor operation in Heating mode.
- f. Units with the unit-mounted thermostat shall include a 2-hour override function. The override switch shall be readily accessible. In override mode the unit operation shall be the same as in occupied mode. Override mode shall be terminated automatically at the end of a 2-hour period.

F. Electrical Requirements:

- 1. A control box shall be located within the unit compressor compartment and shall contain a 50 va transformer, 24-volt activated, 3-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electro-mechanical operation WILL NOT be accepted.
- 2. Units shall be nameplated for use with time-delay fuses or HACR circuit breakers.
- 3. Unit controls shall be 24-volt and provide heating or cooling as required by the remote thermostat.

G. Special Features:

- 1. Aquazone™ Thermostat Controls (for use with remote thermostat units):
 - a. Programmable multi-stage thermostat with 7-day clock, holiday scheduling, large backlit display and remote sensor capability.
 - b. Programmable 7-day light-activated thermostat offers occupied comfort settings with lights on, unoccupied energy savings with lights off.
 - c. Programmable 7-Day flush-mount thermostat offers locking coverplate with tamper proof screws, flush to wall mount, dual point with adjustable deadband, O or B terminal, and optional remote sensor.
 - d. Programmable 5-day thermostat offers 2-stage heat, 2-stage cool, auto changeover, 5-minute built-in compressor protection, locking cover included.
 - e. Non-programmable thermostat with 2 heat stages, 2 cool stages, auto changeover, 5-minute built-in compressor protection, locking cover included.
- 2. Fire-rated hose kits come with a fixed MPT on one end and a swivel with an adapter on the other end. Hose kits can be either stainless steel or galvanized.
- 3. Ball valves (brass body) are for shutoff and balancing water flow. Valves are available with



- memory, memory stop, and pressure temperature ports.
4. Y Strainers (bronze body) are "Y" type configuration with a brass cap and a stainless steel strainer screen. Maximum operating pressure rating of strainers is 3103 kPa.
 5. Solenoid valves (brass body) provide slow operation for quiet system application.
 6. Hose kit assemblies include a ported ball valve with pressure temperature (P/T) plug ports, flexible stainless steel hose with swivel and nipple. Return hose includes a ball valve, preset measure flow (L/s) with two P/T ports, flexible stainless steel hose with a swivel and nipple, balancing valve, and low-pressure drop water control valve.
 7. LON (local operating network) wall sensors are available in 3 models: sensor only, sensor with status override indicator, and sensor with set point, status adjustment override, and digital LCD display.

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Section 6
Tab 6a

Pg 48

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